

Mining

CONGRESS JOURNAL



SEPTEMBER
1956

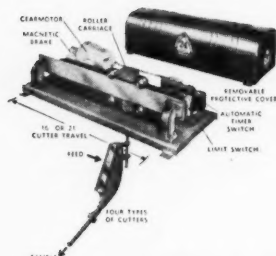


October 1-4 — **AMC MINING SHOW** — See pages 60-81

DENVER CAN SUPPLY COMPLETE EQUIPMENT FOR YOUR MILL

One Responsibility

Crushers, Screens, Feeders, Ball-Rod Mills, Classifiers, Jigs, Pumps, Samplers, Agitators, Conditioners, Flotation, Thickeners, Filters, Dryers, Ore Testing and Mill Design Services.

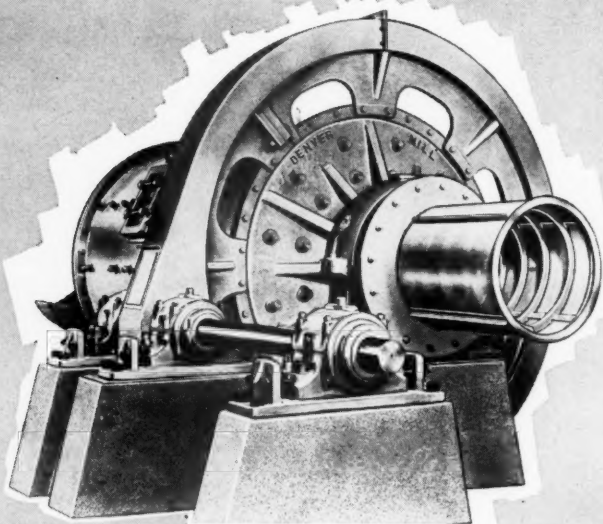


DENVER AUTOMATIC SAMPLERS ... for Positive Mill Control

- Accurate Sampling
- Representative Sampling
- Uniform Sampling
- Rugged Construction

Denver Equipment Co. can supply you with a variety of samplers to meet the many different problems involving size of material (either wet or dry); amount of sample; and frequency of sample cuts.

For complete information, WRITE FOR BULLETIN NO. S1-B4.



COMPARE SPECIFICATIONS AND PRICE OF DENVER STEEL-HEAD BALL OR ROD MILLS

INCREASED CAPACITY—Savings in Initial Cost

The size of a DENVER Ball or Rod Mill is determined by the *working diameter* inside the liners, rather than diameter of the shell, as many other mills are measured. Therefore, DENVER Mills have up to 32% more capacity—with resulting savings in initial cost, since you can buy a shorter mill for the same volume of feed. Sizes from 30"x18" to 7'x16'.

GREATER STRENGTH—Longer Ball Mill Life

DENVER Ball or Rod Mill heads are cast from electric furnace steel, giving greater strength and longer life. Trunnions are designed for low bearing pressure.

COMPARE SPECIFICATIONS—PRICE

Every engineer planning a new Ball or Rod Mill installation will want to study the specifications of DENVER Mills.

1. Larger working diameter—more grinding capacity.
2. Larger bearing surfaces—low bearing pressure.
3. Electric cast steel heads—greater strength.
4. Choice of liners, gears and drive—greater flexibility.
5. Standard construction—faster delivery.
6. Complete wet or dry, single or two-stage systems.

WRITE FOR BULLETIN NO. B2-B13



"The firm that makes its friends happier, healthier and wealthier"

DENVER EQUIPMENT CO.

1400 Seventeenth St. • Denver 17, Colorado
DENVER • NEW YORK • CHICAGO • VANCOUVER • TORONTO
MEXICO, D. F. • LONDON • JOHANNESBURG

GREAT NEW THOR 3-BOOM JUMBO

More rounds per shift! Completely air-operated!

Drills rounds
faster

Easy to set up
and operate

This powerful new "big brother" of the famous Thor two-boom jumbo offers the same time-saving, money-saving advantages—increased by 50%! With three booms you can drill half again as many rounds before shifting to a new location.

Again Thor offers the tremendous advantage of being completely air-operated, with no hydraulics involved. Thor Jumbos are easiest to set up and easiest to operate. Horizontal swing of booms is automatically locked by air pressure, and controlled by operator without leaving position.

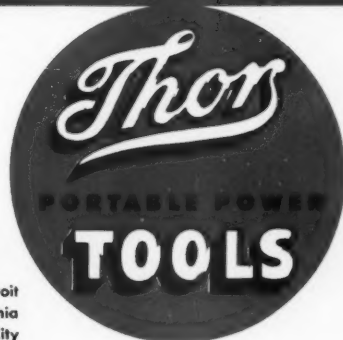
Rounds are drilled faster with a Thor Jumbo because boom position is quickly changed by releasing air pressure. Steels are changed easily and fast. The three booms can support rotary-motor power feed drifters, chain feed masts or air-cylinder feeds.

Hollow booms carry all supply and control pipes. Maintenance is easy and inexpensive because air motors are removed without disturbing booms. Ask your Thor distributor for a demonstration. Thor Power Tool Company.

SEE THE NEW THOR JUMBO AT THE AMERICAN MINING CONGRESS.
BOOTH 300, SHRINE EXPOSITION HALL, LOS ANGELES, OCTOBER 1 THROUGH 4.

THOR POWER TOOL COMPANY, Aurora, Illinois

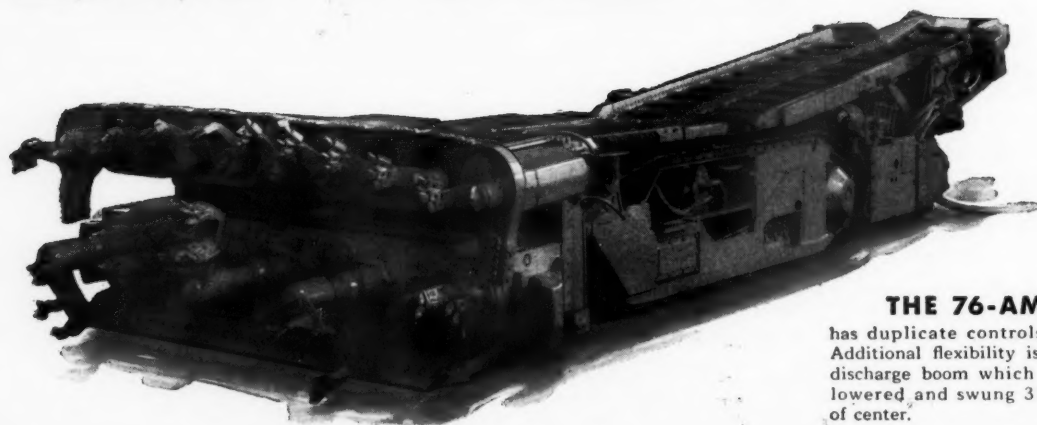
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Houston • Kansas City, Mo. • Los Angeles • Milwaukee • Newark • Long Island City, N.Y. • Philadelphia
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Easy mining not a prerequisite...

Record tonnages
are being mined
in such seams as No. 5 Indiana
and No. 8 Pittsburgh...

JEFFREY 76



THE 76-AM COLMOL

has duplicate controls on each side. Additional flexibility is provided by a discharge boom which can be raised, lowered and swung 31° to either side of center.



76-AM Colmol operating in 42" coal. Note clean roof, walls and floor. Operator is 20' from the face, working in a protected position.

COLMOL®

REMARKABLE PRODUCTION is being credited to the Colmol . . . average tonnages over a period of weeks of 550 per shift and peak tonnages in excess of 750 per shift.

The Colmol requires a minimum of maneuvering, helping to account for this highly efficient performance. It handles easily on its long, wide crawlers . . . can be turned in its own length . . . mines the coal without constant manipulation of controls.

Coal is broken from the face, not ripped or ground off, resulting in favorable overall screen consist.

Designed for working in low veins, the 76-AM Colmol continuous mining machine is applicable to seams ranging from 38" to 54"; the 76-B Colmol for medium-high seams up to 72".

Jeffrey also makes the MOLVEYOR® for continuous transportation behind continuous mining machines, Loaders, Universal Cutters, Conveyors, Shuttle Cars, Face and Roof Drills, Locomotives, Fans and Blowers. For literature, write to The Jeffrey Manufacturing Company, Columbus 16, Ohio.



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Permissibles	Instantaneous
Blasting Powder	Regular Delay
Blasting Caps	Split-second Delay
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SEPTEMBER, 1956

VOLUME 42 • NUMBER 9

Mining

CONGRESS JOURNAL

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Indexed regularly by Engineering Index, Inc.

FRONT COVER: The world's largest borax mine, at Boron, Calif., is being converted from underground to open pit mining. A tour of this operation of the Pacific Coast Borax Co., Division of United States Borax and Chemical Corp., is being organized for October 5 at the AMC Mining Show at Los Angeles.

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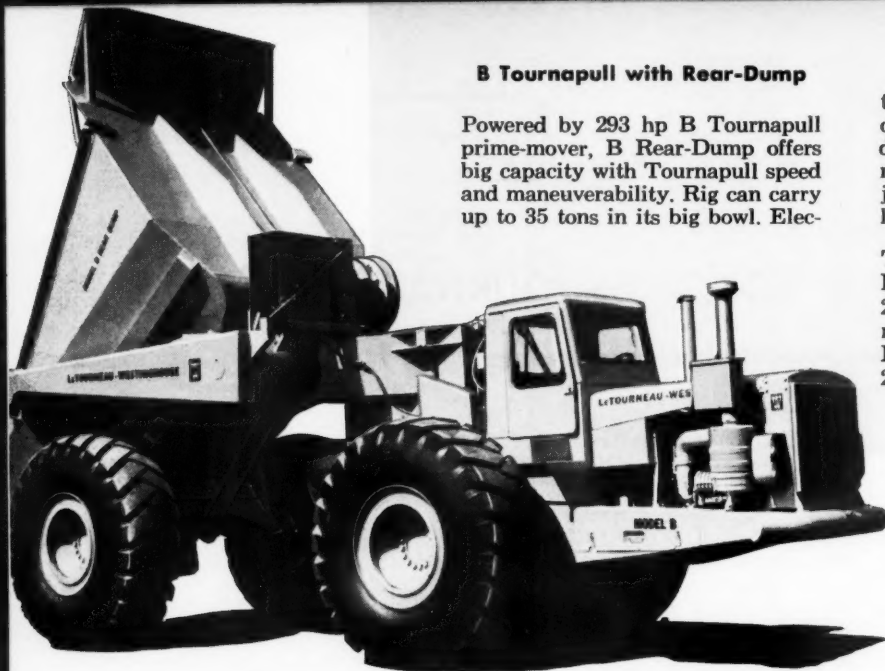
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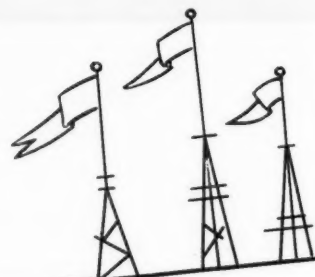


B Tournapull with Rear-Dump

Powered by 293 hp B Tournapull prime-mover, B Rear-Dump offers big capacity with Tournapull speed and maneuverability. Rig can carry up to 35 tons in its big bowl. Elec-

tric-control bowl dumps fast and clean to clear rear-wheels. Simple dump-and-hoist motor control eliminates troublesome hydraulic pumps, jacks, and jointed pipe-and-hose lines. Dump action is instant.

This 35-ton capacity Model B Rear-Dump, with tires 7' high and 22" wide, hauls over pit floors and rough mine roads. Other Rear-Dump models with capacities of 22 and 11 tons are also available.



See these cost-cutting machines at the Mining Show!

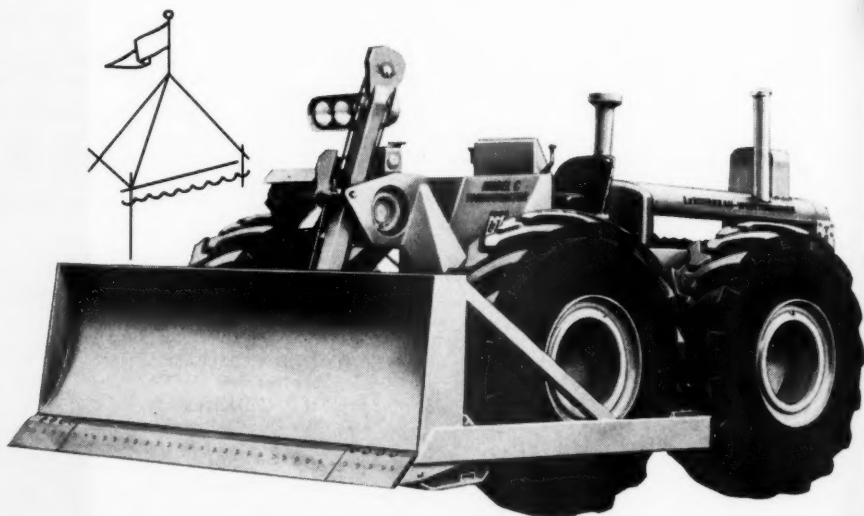
When the 1956 Show of the American Mining Congress opens on Oct. 1 at the Shrine Exposition Hall in Los Angeles, you'll have a chance to see and inspect 4 big, cost-cutting mining tools from the LeTourneau-Westinghouse line. Read about them here — then check their features for yourself at the Mining Show.

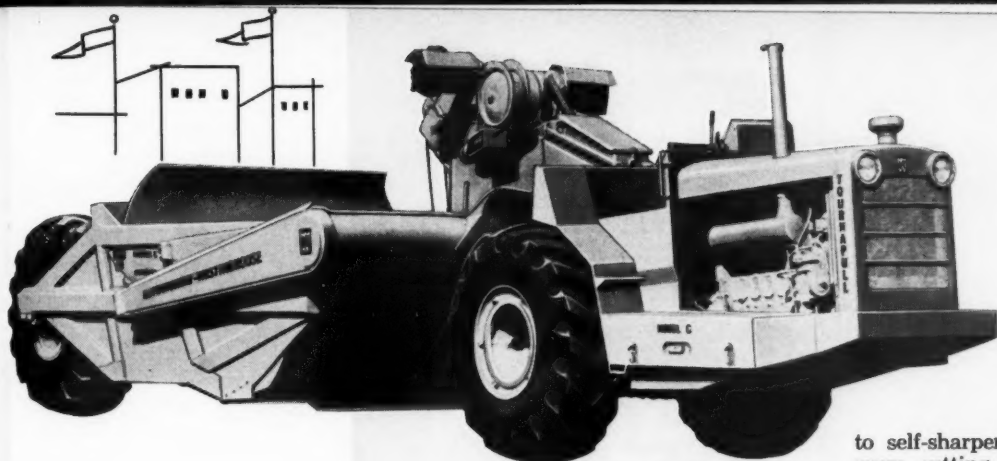
You will have 4 full days to view the show's exhibits. LeTourneau-Westinghouse will have an outside space in Area C, booths 732, 736, and 740.

C Tournatractor

208 hp Model C Tournatractor with 24,700 lbs. push or pull in 1st gear at 1.5 mph... works and travels on or off roads at speeds to 17 mph forward, 7 mph reverse. Combines power and traction with rubber-tired speed and mobility. Can be equipped with bulldozer or angle-dozer blade, or push-plate. Standard railroad coupler can be attached to rear for switching and car-spotting.

At pit or quarry, Tournatractor dozes overburden, prepares drill sites, cleans up around shovels, and tows heavy equipment. At plant, it levels and grades roads, maintains stockpile and positions rail cars. Fast-moving rig's mobility quickly takes it from one job to another.





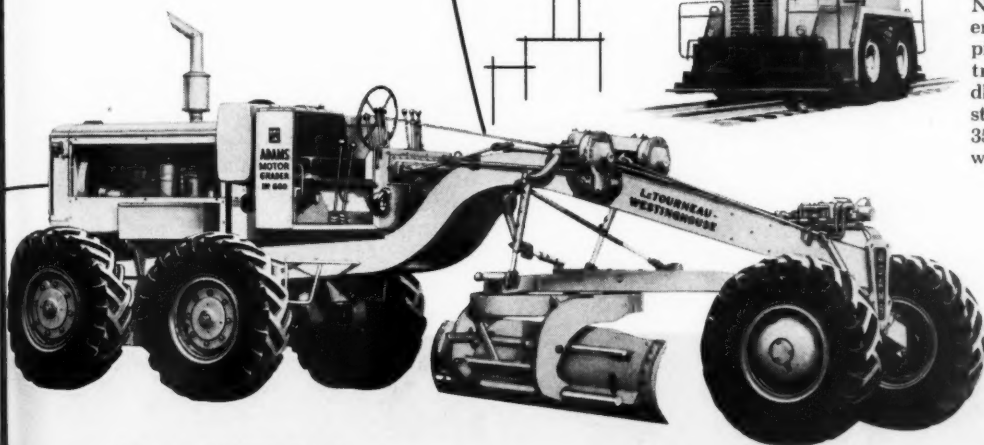
C Tournapull with Fullpak scraper

A new improved scraper for the time-tested, 208 hp C Tournapull prime-mover! 18-yd. C Fullpak has a lower, wider bowl...boils better...loads faster...fills corners and heaps big pay-loads. Low push-block delivers direct-line thrust of pusher

to self-sharpening blade for maximum cutting power.

This is the ideal tool for heavy-duty load, haul, and spread work...for stripping or other dirtmoving around your pit. C Tournapull hauls fast on all surfaces...maneuvers in tight quarters. It can be shovel-loaded for straight haul work. Tournapull scrapers are also available in 7½ and 25-yd. heaped capacity sizes, to meet your needs.

Look for our exhibit
in Area C
booths 732, 736, & 740



Adams "660" Grader

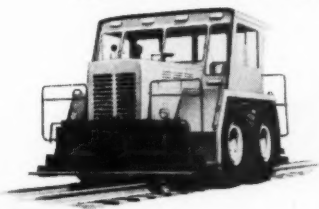
Better haul-road maintenance and general clean up can cut your pit costs. And there is no better tool for this important job than the big 150 hp Adams "660". This grader outperforms all others in its weight class because of wide speed selec-

tion — 8 speeds forward to 26 mph (11 with optional "creeper" gears for rocky grading or toughest scarifying jobs) and 4 in reverse, to 13.7 mph, for fast back-up.

Fast, powerful "660" can handle all these vital pit jobs: maintain haul

roads, clean pit floor, level dumped material, clean washed-out dirt from ore benches, keep drainage open, and clean up quickly after blast. There are 4 other models of Adams graders besides the "660"—all with matching horsepower and weight for their work class.

Not on display... but we'll have literature on: SwitchMobile



New, rubber-tired diesel switcher, cuts across tracks, yards, pit floor, by shortest route...travels by highway...straddles tracks to pull or push strings of cars. 208 hp, weight 35,640 lbs., outpulls any steel-wheel locomotive near its class.

Tournapull, Tournatractor—Trademark Reg. U.S. Pat. Off.; Fullpak, Adams, SwitchMobile—Trademark G-1200-M



LeTourneau-WESTINGHOUSE Company, PEORIA, ILLINOIS
A Subsidiary of Westinghouse Air Brake Company

ARBA



See you at the ROAD SHOW • Chicago • January 28-February 2, 1957

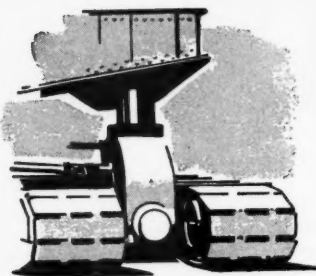
*How to cut
mining
maintenance
costs*



1 Reduce oil inventories

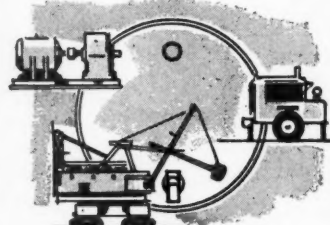
STANOIL Industrial Oil can be used in so many places that you can reduce inventories of special oils. Add to this the economy of simplified storage and handling. Use STANOIL Industrial Oil in electric motors, air compressors, fans, blowers, transmission and clutch lubrication, and hydraulic systems. Use STANOIL to lubricate bearings either in direct application or in oil circulating systems.

**Use STANOIL Industrial Oil—
save these three ways**



2 Get better lubrication

Special solvent-refining techniques plus the blending in of exclusive additives make STANOIL the finest industrial oil. STANOIL resists chemical change . . . lubricates effectively and completely over a wide temperature range . . . cuts wear. It protects oil systems from troubles due to carbon deposits, corrosion and emulsion. It stands up under heavy and repeated shock loads. STANOIL has high oxidation stability and extremely low carbon forming tendency.



3 Prevent application mistakes

When there is only one lubricant, there can't be any chance of the wrong one being used. With STANOIL, errors in application that would result in breakdowns are eliminated; equipment stays in service longer; maintenance is easier; overhauls go more smoothly and equipment is back in service faster.

Get more information about STANOIL Industrial Oil. Call your Standard Oil industrial lubrication specialist.

He is experienced in mine lubrication. There is one near you in any of the 15 Midwest and Rocky Mountain states. Or write, Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.



STANDARD OIL COMPANY
(Indiana)

Quick Facts About

STANOIL Industrial Oil

- **Stability**—STANOIL's antioxidant gives oil resistance to chemical change, minimizes deposits.
- **Cold Starts**—STANOIL has low pour point. Flows freely from cold start. No need for costly warm-ups.
- **Rust Prevention**—The inhibitor in STANOIL "plates out" on metal surfaces, prevents corrosion.
- **Resists Effects of Temperature Change**—STANOIL has high viscosity index, resists temperature change.
- **Has Excellent Demulsibility**—STANOIL is refined to eliminate emulsion problems, contains additive to minimize foaming.

In California...and the World Over

Bucyrus-Eries Live Up to Reputation for High Output



Bucyrus-Erie 6-yrd. 150-B shovel working at Eagle Mountain mine. Ore bearing formations here are high in iron content and considerably heavier than most rock.

Miners the world over have learned to expect outstanding performance from Bucyrus-Erie Ward Leonard electric shovels — and they get it, no matter how tough the assignment.

The machine above, for instance, is on a California project where it handles massive, heavy iron ore and waste rock — an extremely hard, fine rock which is quite abrasive. It's a true test of an excavator's strength and durability but here, as on other tough jobs the world over, the Bucyrus-Erie shovel moves big yardages economically — day after day, month after month.

It's the *extra margin of quality*, both in design and

manufacture, that qualifies Bucyrus-Erie Ward Leonard electric shovels for world-wide acceptance — and lets them live up to it. We would like the opportunity of explaining that extra margin of quality — and what it can mean in performance on your job.

119156

BUCYRUS-ERIE COMPANY

SOUTH MILWAUKEE, WISCONSIN

See us at the MINING SHOW
BOOTH 516, Shrine Auditorium
Los Angeles, Calif., Oct. 1-4



**IT PAYS
TO**

specify

WHEAT

**ELECTRIC
CAP LAMPS**



BECAUSE with WHEAT ...

you benefit by:

- **FULL-SHIFT ILLUMINATION**
High percentage of initial light efficiency right through the end of the shift
- **CONTINUOUS HIGH-LEVEL EFFICIENCY**
Low initial cost permits battery replacement as needed assuring continued new lamp performance
- **TRUE AUTOMATIC CONSTANT-POTENTIAL CHARGING**
Charging is regulated automatically without manual attention on the part of the lampman
- **MINIMUM MAINTENANCE**
Weekly watering, bulb replacement and ordinary cleanliness
- **LEAK-PROOF BATTERIES**
Regardless of position, electrolyte cannot escape
- **LARGE BATTERY CAPACITY**
Yet small compact battery weighs only 64 ounces

... and avoid:

Light levels which lower appreciably during the shift

The penalty of dwindling efficiency and poor performance just to obtain long life

Costly manual attendance and variable charging

Having covers to open, valves to free, terminals to clean, lamps to rack, cells to resolution

Burns from electrolyte

Cumbersome battery size and excessive weight

*the trend
is to
WHEAT!*

**National Mine
Service Company**



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WESTERN KY. DIVISION
Madisonville, Ky.

WHITEMAN DIVISION Indiana, Pa., and Morgantown, W. Va.

how to get the most out of HOLLOW DRILL RODS

The present trend in mining is toward smaller drill holes which require the use of smaller bits and, consequently, smaller hollow drill rod sizes. And that's increased the use of *alloy* steels such as Crucible CA DOUBLE DIAMOND and 4E Hollow Drill Rods.

These new alloy rods have proved themselves on many jobs by lengthening rod life, cutting drilling costs. But they are not unmixed blessings, for they will give a good account of themselves only if they are handled properly. Hammer and tongs blacksmithing isn't enough. Alloy rods demand greater care in forging, upsetting and heat-treating.

Should You Use Carbon or Alloy Rods?

There's no one answer to that question, unless it is *use the rod that best fits the individual job*. Gen-

erally, air-feed jackhammers and other small, light drills benefit from the use of alloy drill rods. For alloy rods have greater resistance to fatigue, higher elastic limits — important where smaller rod sizes are used.

Rod Stiffness . . .

Rigidity or stiffness can only be increased by enlarging the cross section of the rod. If you decrease the cross section you'll get more whipping no matter what type steel you use, or how you heat treat it. Therefore, don't use a $\frac{7}{8}$ " hexagon alloy rod when you've been using a $1\frac{1}{4}$ " round carbon rod, unless an increase in flexing and less stiffness is unimportant.

Abrasion Resistance . . .

The higher the hardness the better a drill rod will stand abrasive wear. Alloy rods have the advantage in this respect, for they can be heat-treated to higher hardnesses than can carbon rods.

Notch Effect . . .

Notch effects caused by failure to overlap heats in treating shanks, or those caused by careless handling, chain marks or corrosion pits all cause rod failure. Alloy rods are more resistant to these nicks or notches than carbon steels, but when they do occur failure can be more rapid.

The answer to better drilling is simply this: choose the right drill rod, and then give it reasonable and proper care.

And for the *right* carbon or alloy hollow drill rods — in the sizes, shapes, and grades you need — Crucible is the place to go. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

Visit us at Booth 201
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**CRUCIBLE**

first name in special purpose steels

Crucible Steel Company of America

THIS IS IT!

your hospitality center at the show...



Yes, CF&I's exhibition booth will be fully equipped as a hospitality center at the Mining Show in Los Angeles. There'll be everything you need to make your stay comfortable and suc-

cessful. Whether you want ice water, a place to sit down and relax, telephone service, or even secretarial assistance, you'll be able to get it at CF&I's hospitality center—Booth 440.

THE COLORADO FUEL AND IRON CORPORATION

DENVER • OAKLAND • NEW YORK



2610

Idaho Mine Reports Superior Blasting with Du Pont Dynamite, Delay Caps



1. LOADERS distribute Du Pont Delay Electric Blasting Caps in 42-hole drift round prior to loading at the Crescent Mine of the Bunker Hill Co. at Kellogg, Idaho.



2. FACE ready for shot. Load is Du Pont "Gelex" #1 (1 1/8 x 8), primed with Du Pont MS and regular Delay Caps—a winning combination for effective blasting.



3. BLASTER fires the shot with a Du Pont CD-32 Blasting Machine. This lightweight machine eliminates the necessity of maintaining permanent firing lines . . . yet can fire up to 480 caps in parallel series.



4. RESULT of the blast—excellent breakage, which speeds loading. Good fumes of "Gelex" get the scalers and muckers back quickly. Try the dependable line of Du Pont mining products in your operations!

You can enjoy the same excellent fragmentation and on-schedule operations by using Du Pont Explosive and Blasting Supplies in your mine. Your Du Pont representative will be glad to go into further detail. E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Delaware.

Invitation

AMERICAN MINING CONGRESS
(Metal Mining Section)

Be sure to visit us at Booth #139

Los Angeles—October 1-4

DU PONT EXPLOSIVES

Blasting Supplies and Accessories



REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

Nordberg

GRINDING

... built to meet the exacting requirements
of the MINING INDUSTRY

NORDBERG MACHINERY is the result of specialized engineering skills aided by unsurpassed manufacturing facilities. For over half a century Nordberg has produced heavy machinery for the mining industry, which has become well known all over the world for its advanced engineering, excellent construction, high efficiency and dependable service.

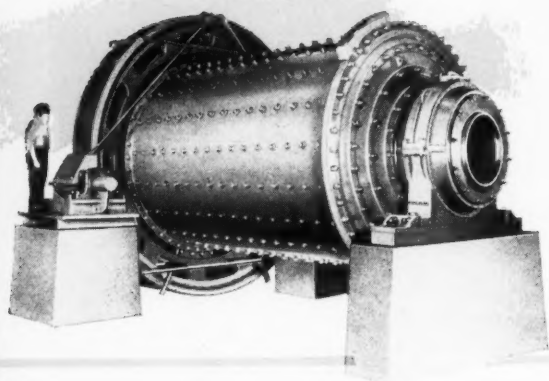
Included in this broad line of heavy machinery is the complete line of Nordberg Grinding Mills,

designed and built to meet the most exacting requirements of the mining industry . . . for wet or dry grinding of metallic and non-metallic minerals, and in other processes where friable material must be comminuted to fine sizes.

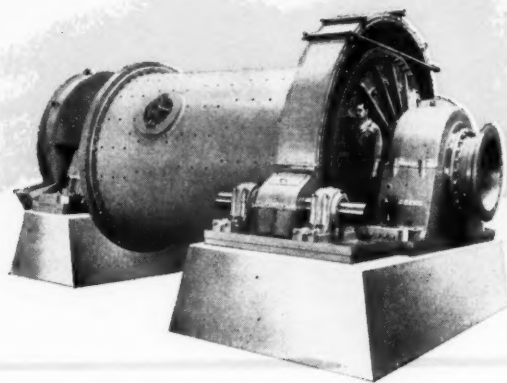
Nordberg Grinding Mills are manufactured in sizes ranging from 6 to 13 feet in diameter and up to 50 feet in length. Types include Ball, Pebble, Rod, Tube and Compartment Mills.

Write for further information.

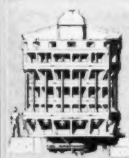
NORDBERG MFG. CO., Milwaukee, Wisconsin



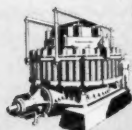
• Typical Nordberg dry grinding Rod Mill, measuring 10'-6" in diameter by 16' in length, for ore processing service. Mills of this type are in wide use in the mining industry, delivering maximum output at lowest possible cost.



• View showing discharge end of Nordberg 10'-8" x 17' wet grinding Ball Mill with Scoop Feeder. Whether wet or dry process, open or closed circuit operation, there is a Nordberg Grinding Mill built for the job.



**SYMONS
ROTARY CRUSHERS**



**SYMONS
CONE CRUSHERS**



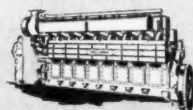
**NORDBERG
KILNS AND COOLERS**



**NORDBERG
MINE HOISTS**



**SYMONS VIBRATING
GRIZZLIES AND SCREENS**



**NORDBERG DIESEL • DUAL FUEL® and
SPARK-IGNITION GAS ENGINES**



MILLS

- Four Nordberg $10\frac{1}{2}' \times 16'$ Rod Mills and eight Nordberg $10\frac{1}{2}' \times 14'$ Ball Mills installed in a large concentrating plant for the reduction of hard, abrasive taconite iron ore.

NORDBERG



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TORONTO • MEXICO, D.F. • LONDON • JOHANNESBURG

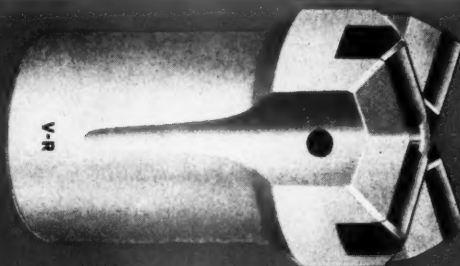
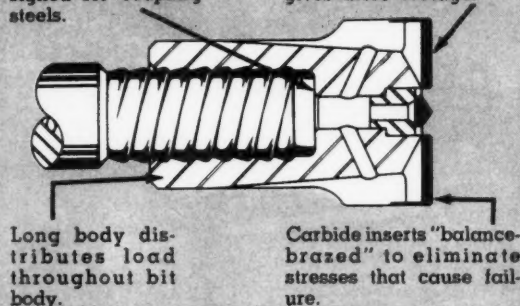
SYMONS...

A REGISTERED NORDBERG TRADEMARK
KNOWN THROUGHOUT THE WORLD

V-R Bits...drill more on any job!

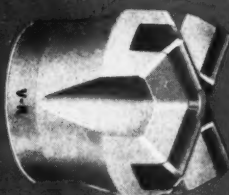
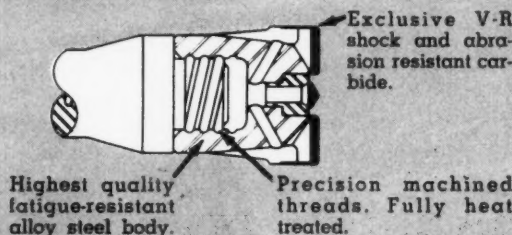
Load is carried where body is strongest. Specifically designed for coupling steels.

Exclusive grade of carbide—manufactured by V-R—wears longer, gives more footage.



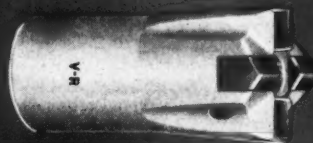
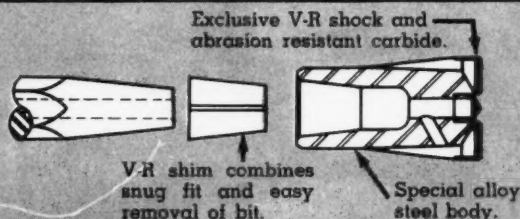
V-R BOTTOMING BITS

... an original V-R development—the steel drives against the bottom of the bit body. See diagram. 19 sizes—1 1/4" through 5". Thread types 200, 400, 600, 700 and 1000.



V-R SHOULDER BITS

—16 sizes 1 3/8" through 4". Thread types F, H, D, K, 113, 115 and 121.



V-R PUSH-ON BITS

—11 sizes 1 1/4" through 1 7/8" for new or reconditioned steels.

Wherever there is rock, V-R Bits are building a reputation for fast, low cost drilling. There are good reasons:

Exclusive Carbide Grades. Since 1930, Vascoloy-Ramet Corporation has been a recognized leader in the manufacture of cemented carbides for severe wear applications. The carbide in V-R Bits is a recent, exclusive development providing exceptional impact and abrasion resistance.

Precision-Set Blanks. V-R carbide inserts are perfectly positioned in the bit body, preventing irregular stresses that shorten bit life.

Heavy-Duty Precision-Ground Bodies. Exclusive design, special non-fatiguing alloy steel, controlled heat treating, accurate threads and precision grinding produce V-R quality products.

Use the bits that are beating them all—V-R Bits!

ASK FOR CATALOG

—call your V-R representative or distributor, or write:



Visit V-R at the Mining Show, Booth 334, Los Angeles, Oct. 1-4



Vascoloy-Ramet Corporation

SUBSIDIARY OF FANSTEEL METALLURGICAL CORPORATION
836 Market St., Waukegan, Ill.

MANUFACTURERS OF CEMENTED CARBIDES, MINING AND CONSTRUCTION BITS, CUTTING TOOLS

M-593

EXIDE-IRONCLAD BATTERIES

For all mining applications



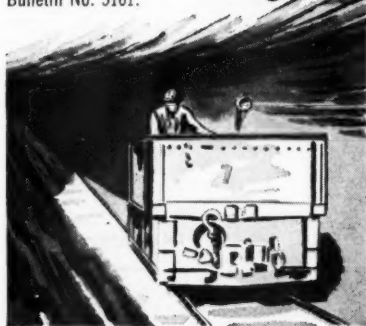
Cold test



Heat test

Deliver the power over a wide range of temperatures

BATTERY FOR MINE LOCOMOTIVE, Exide-Ironclad Model MVM. Write for copy of Bulletin No. 5161.



At few places on earth do storage batteries ever encounter such extremes of cold and heat as are used to test Exide-Ironclad Batteries in the laboratory.

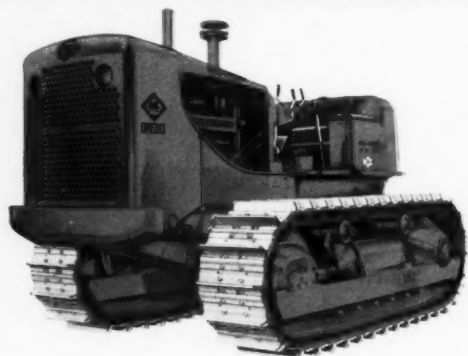
These tests prove that Exide-Ironclad Batteries can be depended upon over a wider range of temperatures than they are ever likely to be asked to endure. And they provide tangible extra assurance of dependability at all the more normal operating temperatures.

Extreme temperature performance is especially important when a battery must have continuous dependability. It is often at these extremes that a battery is most needed. And a battery cannot be called dependable unless it can be counted on every day—all of the time.

The high and low temperature performance of Exide-Ironclad Batteries is a direct result of their unique construction features and special engineering. In countless applications, these batteries have earned an unmatched reputation for long life and high capacity. When you need batteries for heavy duty uses, be sure to specify Exide-Ironclad. Write for detailed bulletin. Exide Industrial Division, The Electric Storage Battery Company, Philadelphia 2, Pa.

Exide®

SERVING THE MINING INDUSTRY



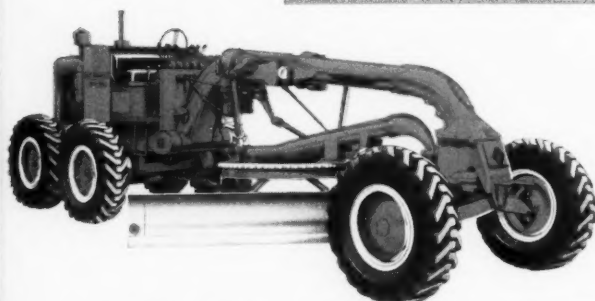
Crawler Tractors

HD-21 (Largest of 4 Allis-Chalmers models)
Torque Converter Drive
204 net engine hp, 44,000 lb

Surface Mining

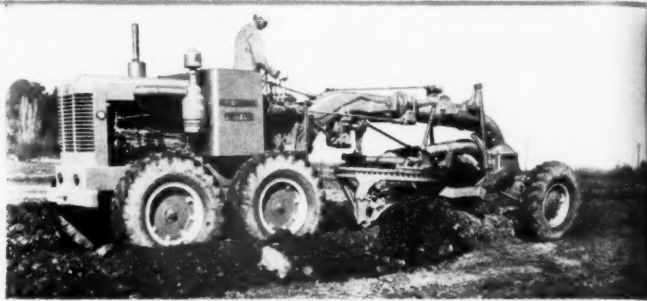


Crawler tractors with matched bulldozers handle stripping, stockpiling and many other jobs. Allis-Chalmers exclusive Box-A Main Frame does not transmit strain from dozer to engine, clutch or transmission — just one of many proven features that give long life.



Motor Graders (model Forty Five illustrated)

Three diesel-powered models up to 23,800 lb
One gasoline engine model
50 hp, 8,800 lb



Motor graders combine power and minute precision as they level pit bottoms or prepare dragline sites. Adjustable seat, power steering and pilot house visibility of this Model Forty Five help the operator work better with less effort.



Motor Scrapers

TS-260 (illustrated) 14-cu-yd capacity, heaped
TS-360 20-yd capacity, heaped
Also 5 pull-type scrapers
Capacities from 2 to 18 cu yd



For big-volume stripping, you can count on Allis-Chalmers motor scrapers to load fast, travel fast and dump clean. Special, high-apron lift prevents material from jamming. Even when loaded from overhead, anything that can be put into the bowl can be easily ejected.



Motor Wagons (TR-260 illustrated)

Rear- and bottom-dump models
Bodies interchangeable with
motor scraper bodies



Large top area of this Allis-Chalmers bottom-dump motor wagon permits fast loading with less spillage. Positive hydraulic steering lets operator spot wagon quickly without tiring wheel fight. Hydraulically operated doors allow full or controlled dumping.

MODERN ALLIS-CHALMERS EQUIPMENT

Hauling and Haul Roads



Allis-Chalmers crawler tractors and pull-type scrapers are an ideal team for tough cut and fill work and short-haul stripping. Whether pushing or pulling, Allis-Chalmers torque converter drive sets new standards of tractor-scraper performance.



The low-cost Model D is a real economy leader on haul road maintenance jobs. It has tandem drive ROLL-AWAY moldboard, tubular frame and other big-grader design and performance features, yet it costs only one-third that of large machines.



The TS-260 motor scraper develops 18 hp per cu yd struck capacity. This gives you high travel speed when it counts most — traveling with a payload or working on adverse grades. Positive, controlled hydraulic steering permits fast, safe travel.



Wheel base on the TR-260 rear-dump motor wagon does not change while dumping. Thus, operator can lock air brakes on all four wheels while dumping over steep drops — an important safety advantage. Smooth interior, plus high, 70° tilt assures fast, clean dumping.

Underground Mining



The 1 1/2-yd HD-6G excavates ore, transports it to the surface, or loads shuttle cars underground. Tractor Shovels are available for all four Allis-Chalmers tractors with buckets up to 4 cu yd. All have electric starting on diesel fuel for greater safety.

SEE US AT THE
MINING SHOW
LOS ANGELES, OCT. 1 to 4
BOOTH Nos. 737-733-729-
725-836-832-828-824

Keeping Step with Stepped-Up Demands

In the past 15 or 20 years, the mining industry has kept production costs down in spite of rising labor and material costs. To do it, mine operators have pioneered new methods that put constantly increasing demands on machinery.

Through the years, Allis-Chalmers has kept pace with these conditions by gearing its equipment development to the mine operator's needs. Here is just a small sample of this modern equipment at work. For further information write Allis-Chalmers — producer of the most complete line of major mining tools.

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION
MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS



ROLL-AWAY is an Allis-Chalmers trademark.

JONES DRIVES SOLVE SPACE

Dual-Series Drive Arrangement Operates 2,800 TPH

A dual-series drive arrangement was the answer to a difficult space limitation problem at a copper mine in Northern Michigan. Versatile Jones speed reducers made it possible to mount both drives on the right side of the head shaft. Otherwise, it would have been necessary to construct an overhanging structure to support and house a drive unit on the left side.

This particular multiple drive takes advantage of the extra ruggedness built into equipment from the Jones Machinery Division of Hewitt-Robins. The low-speed (output) shaft of the speed reducer adjacent to the conveyor head shaft transmits the *full torque* required to drive the conveyor.

The speed reducers are standard Jones 405 DH double reduction herringbone types with ratios of 15.3 to 1. They operate a 338-foot heavy-duty belt conveyor at 2,800 tons per hour on an incline of 18°18' for a vertical lift of 106 feet.

Such special-purpose combinations of standard drive equipment to meet specific industrial requirements have long been the particular province of the Jones Machinery Division of Hewitt-Robins. Suiting the equipment to the need requires not only a broad background of engineering experience, but also a wide range of versatile, reliable power transmission products. Jones Machinery Division offers both the techniques and the equipment.

For information about Jones power transmission equipment, write to Hewitt-Robins, Stamford, Connecticut.



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BOOTH #200 METAL MINING SHOW
Los Angeles, Oct. 1-4**

Also learn about our other industrial products: Vibrating screens and conveyors; Belt conveyors and belting; Industrial hose; "Jones" power transmission equipment; Design, manufacture, engineering and erection of complete bulk materials handling systems.

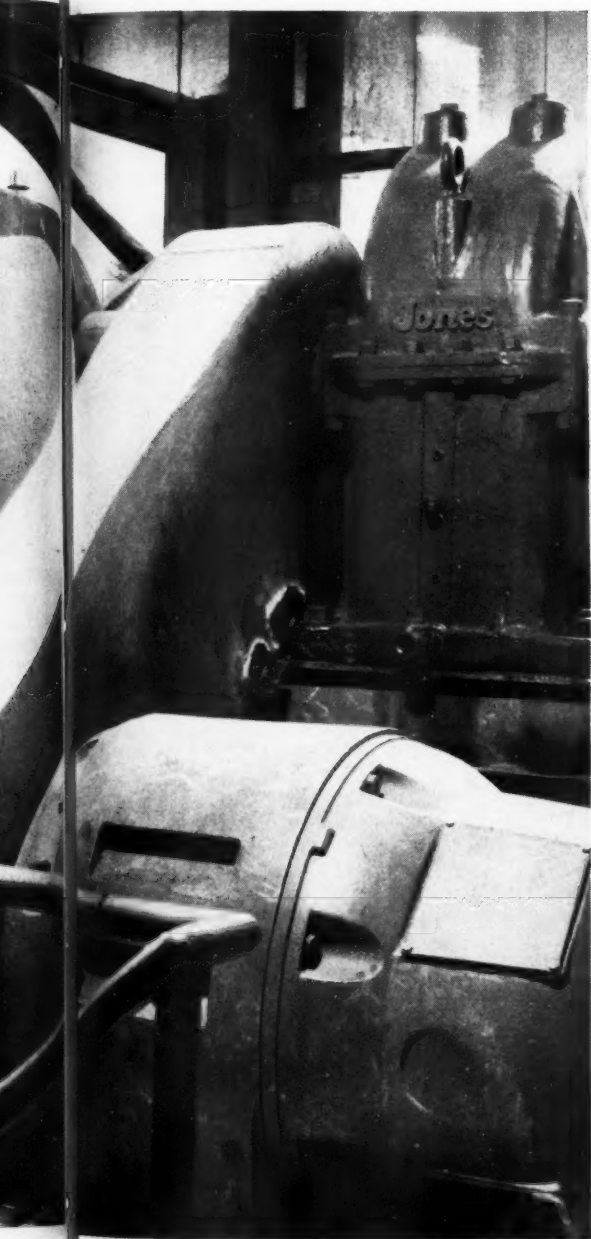


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BELT CONVEYOR SYSTEMS. Complete engineered systems from face through preparation plant...or individual units such as shuttle conveyors, underground haulage conveyors and slope conveyors.

VIBRATING SCREENS. A large variety of screens and dewaterizers for coal mining operations. Revolutionary new hi-G for greater capacity with less power; Gyrex positive stroke 4-bearing; Eliptex horizontal, flat-operating; Vibrex full-floating, unbalanced pulley-type; Eliptex Dewaterizers with specially designed Eliptex screen with micron-size opening stainless steel flat rod deck.

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ON BELTING AND HOSE
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INDUSTRIAL SUPPLY DISTRIBUTOR
LISTED IN THE "YELLOW PAGES"



INTRODUCING the latest addition to the famous line of
Timken carbide insert and multi-use bits:

New Timken® tapered

It's removable—

Lets you get full life out of drill steel
—lowers reconditioning costs

It remains secure—

Precision tapered socket gives a
secure union between bit and steel

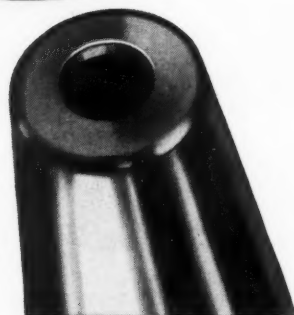
For the first time in the United States, the Timken Company introduces a rock bit for air-leg drills and light stoping with all the many advantages of removable bits, all the advantages of carbide insert bits, and specially designed frontal features to cut your drilling costs per foot of hole. Plus a consistently uniform tapered socket that assures a secure union between bit and drill steel, reduces breakage, and detaches quickly and easily!

With the new Timken® removable tapered socket bit you'll get full life from your drill steel, cut your reconditioning costs, and you can change bits faster. And like other Timken carbide insert bits, the Timken tapered bit will hold its gauge longer, drill faster, cut your bit costs on really tough drilling jobs. Special analysis carbides give the Timken tapered bit superior wear-resistance, with added shock-resistance. Adds life to the bit. Other new mechanical features—specifically made to cut drilling costs on air-leg drills and light stoping—include five specially positioned front blowing and washing holes, and new extra clearance between wings for speedier chip removal.

This new Timken tapered bit can be reconditioned many times. And the body is made of special analysis Timken electric furnace fine alloy steel—with the finest physical properties obtainable in a rock bit today. For more details, get your free Timken tapered bit brochure! Write to: The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

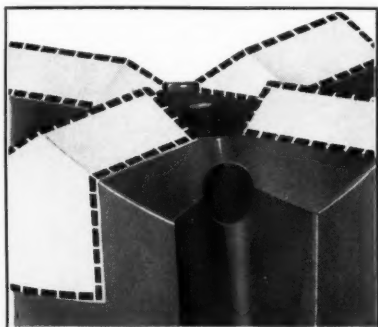


See us at the
1956 MINING SHOW
Oct. 1-4, Shrine
Exposition Hall,
Los Angeles, Cal.,
BOOTH 635.

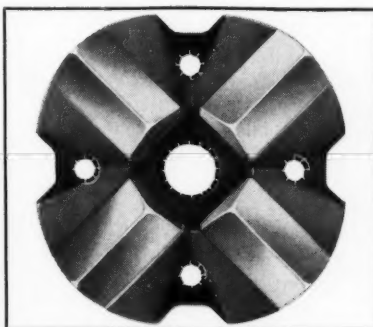


socket bit

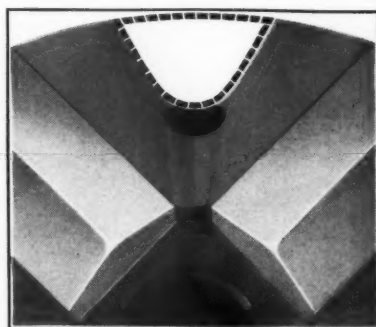
FOR AIR-LEG DRILLS AND LIGHT STOPING



LONGER BIT LIFE FROM WEAR-RESISTANT CARBIDES: Special analysis long-life carbide inserts give the 4-point "cross" cutting face superior wear-resistance, with added shock resistance. This new cutting edge adds service life to your bit, *lowers your cost per foot-of-hole.*



JET ACTION FROM 5 FRONT HOLES SPEEDS DRILLING: Positioned to direct water against face with more velocity, wash away chips faster. Larger center hole, with plug dropped deeper for freer cutting action, less drag on bit. New frontal design adds life to bit, *cuts your cost per foot-of-hole.*



FASTER CHIP REMOVAL WITH DEEPER, WIDER CLEARANCE: Extra deep, wide clearance, works in conjunction with five front holes to speedily remove chips from the cutting face. Speeds drilling, makes cutting more efficient, adds life to bit, *helps to lower your cost per foot-of-hole.*

Improved Timken Threaded Carbide Bit for all your other tough drilling jobs

An improved version of the famous Timken threaded carbide bit! Offering deeper, wider clearance between wings—and special analysis carbide inserts for superior wear-resistance—this new Timken threaded bit offers two additional features: new, *deeper undercut* under the heel, and a new, improved thread contact! The deeper undercut adds life to your bit by improving extra clearance for washed-back

chips and abrading particles—and reduces drag on the bit during drilling. A new redesigned heavier wing also contributes to faster drilling and longer bit life. By adding service life to your bit these newly designed features *lower your drilling cost per foot-of-hole.* For more details, write for your free copy of our newest brochure on Timken Threaded Removable Rock Bits.

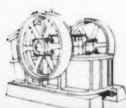


TIMKEN

REMOVABLE ROCK BITS

TRADE-MARK REG. IN U. S. PAT. OFF.

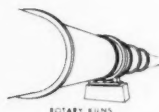
Your best bet for the best bit for every job . . . threaded carbide insert, multi-use tapered carbide insert



BOOTH 922

MINING SHOW SAN FRANCISCO

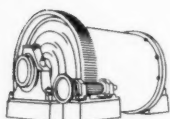
the meeting place for mining men



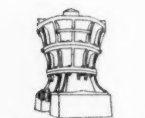
ROTARY KILNS



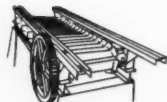
SECONDARY GYRATORY CRUSHERS



BALL MILLS



PRIMARY GYRATORY CRUSHERS



APRON FEEDERS

For more than half a century, leaders in the mining industry have depended on Traylor-Made machinery for trouble-free operation, profitable production and long-life service. The success these operators have had with Traylor-Made machines is probably best emphasized by the impressive number who return time after time for additional Traylor equipment.

Today, more than ever before, profits depend largely on production economies. We'd like to tell you about the many design improvements and advantages of Traylor Machinery that will help you keep pace with modern methods . . . so don't forget to drop in at booth 922 when in San Francisco. We'll be looking for you.

TRAYLOR ENGINEERING & MFG. CO.
856 MILL ST., ALLENTOWN, PA.

SALES OFFICES: New York • Chicago • San Francisco
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A Traylor LEADS TO GREATER PROFITS



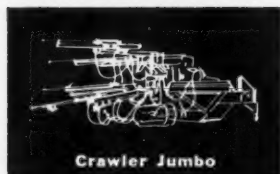
- A RUGGED, HEAVY DUTY UNIT, the Oremaster was developed to permit the operator of trackless haulage mines to use rubber-tired equipment in low head room and narrow drift areas. If your drifts are 8' x 8', you can use this truck and have room to spare.
- Specifications include: over-all length—18' 0", over-all width—6' 6" and over-all height 5' 6½". The Oremaster's complete weight is only 9,380 lb and yet it can carry 12,000 lb of payload quickly and efficiently.
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- Travel time is stepped up between loading points by the GM Diesel Engine and Allison Torqmatic Transmission with torque converter, saving wear and tear on tires, rear end and drive lines.
- Since the Oremaster has three speeds in either direction, the heading can be worked without turning the truck around. Backing into the heading is no problem with this unit.
- Safety measures are maintained by the large air brakes with parking lock, holding truck while loading, sealed beam lights front and rear, and its general versatility in all phases of mining.

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& ENGINE CO.**

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I-R HYDRA-BOOM JUMBOS

mean faster, easier rock drilling

THE HUGE, self-powered and self-propelled Hydra-Boom drilling rig shown above was designed and built by Ingersoll-Rand for use in a large, underground limestone mine. With two extendable towers, each carrying two centrally-controlled Hydra-Booms, it gives complete coverage of a 40-foot high face.

Other typical Hydra-Boom drilling rigs are illustrated at the left, show-

ing the *unlimited versatility* of these fast-acting, hydraulically operated boom mountings. Wherever you need effortless, fingertip control of drill spotting — wherever you want to convert setup time into drilling time — it will pay you to do the job with a Hydra-Boom rig. Let us help you engineer your unusual drilling problems. Write today, also ask for your free copy of Bulletin No. 4162.

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He can supply a wide range of engines for any fuel — gasoline, diesel, LP gas, natural gas — for any use ... stationary or mobile-power units, fan-to-flywheel engines, generating sets or marine engines. Each has the high-efficiency, long-life characteristics necessary for continuous as well as stand-by service. With a high degree of interchangeability of parts, you can use a different type of engine for each application and yet maintain a small stock of parts.

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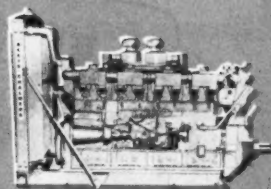
any FUEL

DIESEL ... GASOLINE

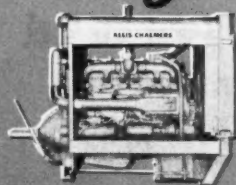
LP GAS ... NATURAL GAS

any SIZE

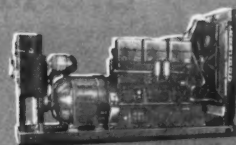
9 TO 515 HP



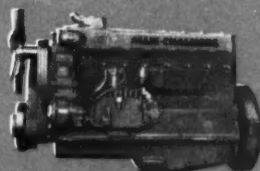
any TYPE



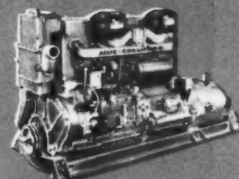
OPEN OR ENCLOSED POWER UNITS



GENERATOR SETS

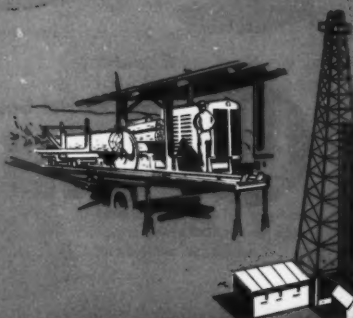


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MARINE ENGINES

any USE



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American Mining Congress
Los Angeles, October 1-4

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U. S. Matchless Wire Braid Air Hose



No "babying" needed here! U. S. Rubber Engineers designed this premium quality hose with more than enough brute strength and stamina to withstand the *highest* working pressures, the *toughest* construction conditions.

And U. S. Matchless® has *proved* its ability to take both use and abuse *indefinitely*—on jobs around the world—serving long after ordinary hose has been ruined by abrasion, crushing and high pressure.

Yet in spite of its great strength, U. S. Matchless is highly flexible—practically as easy to handle as a garden hose.

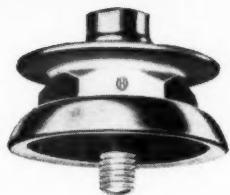
Mandrel-made, wrapped-finish U. S. Matchless Wire Braid Air Hose is available in 50 ft. lengths from any of our 28 District Sales Offices, or by writing to us at Rockefeller Center, New York 20, N. Y. *Whatever* your hose requirements, it *pays* to turn to "U. S." There's a job-engineered U. S. Hose for practically every purpose—a staff of "U. S." Engineers to assist you in your hose selection.

- * tube of high quality neoprene is completely resistant to line oil
- * special steel wire braid gives tremendous strength, permanent bonding assured by heavy gauge rubber layer
- * additional layer of rubber under specially coated rayon breaker protects wire against corrosion should cover be cut or damaged
- * cover of carefully selected, tough brown natural rubber fights off injury from rocks, tools, and heavy equipment

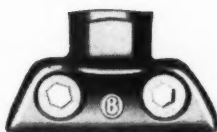


Mechanical Goods Division

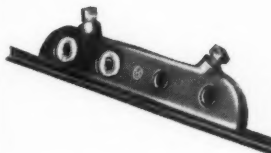
United States Rubber



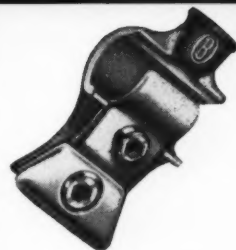
Insulated Hangers



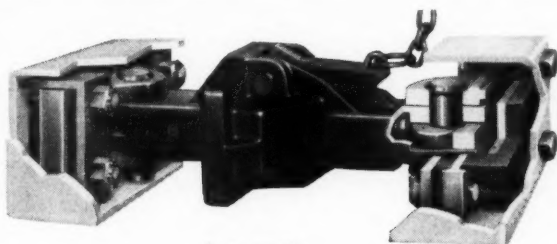
Trolley Wire Clamps



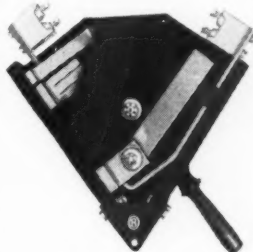
Feeder and Trolley Splicers



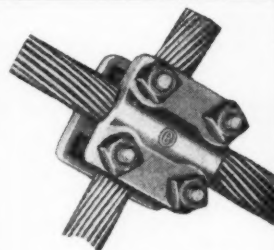
Combination Feeder-Trolley Clamps



Automatic Couplers



Feeder Safety Switches
(cover removed)



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Ohio [®] Brass

First in Mine Haulage!

Ohio Brass is one of the world's largest suppliers of electrified mine haulage equipment—has been since before the turn of the century. That's why so many operators look first to O-B for the answers to their mine haulage problems. You, too, can get the "how-to-do-it" information you're looking for simply by using the handy coupon below.

LOCOMOTIVE EQUIPMENT

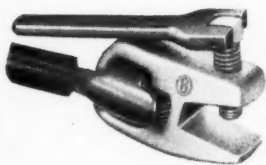
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AUTOMATIC COUPLERS

SAFETY AND

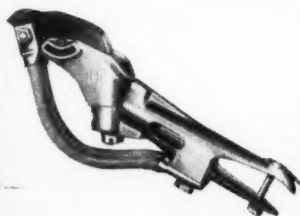
CONTROL EQUIPMENT



Rail Clamps



Expansion Bolts



Current Collectors



Fused Taps

OHIO BRASS COMPANY

MANSFIELD, OHIO

Please send information on the products circled below:

Name _____

Position _____

Address _____

1 2 3 4 5 6 7 8 9

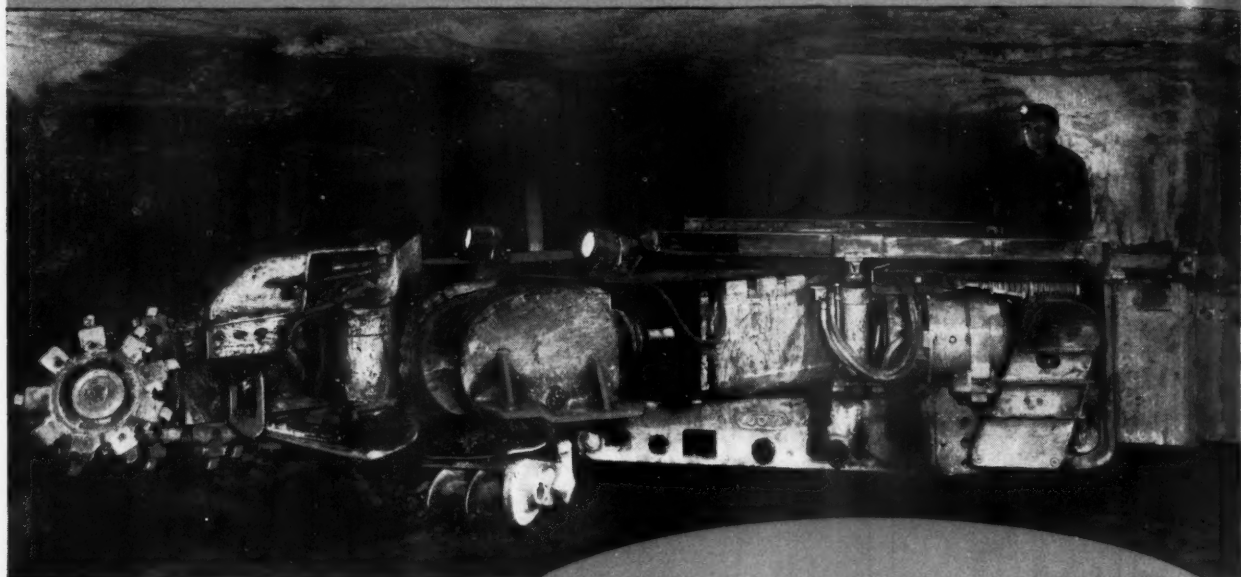
10 11 Other _____

Please send the O-B publications checked below:

- ☐ Catalog 27—A storehouse of ideas for more efficient mine haulage.
- ☐ Haulage Ways—A monthly publication bringing 8,000 mining men "how-to-do-it" articles and new product information.
- ☐ Supplement No. 1—Aluminum feeder cable fittings and correct installation procedures.

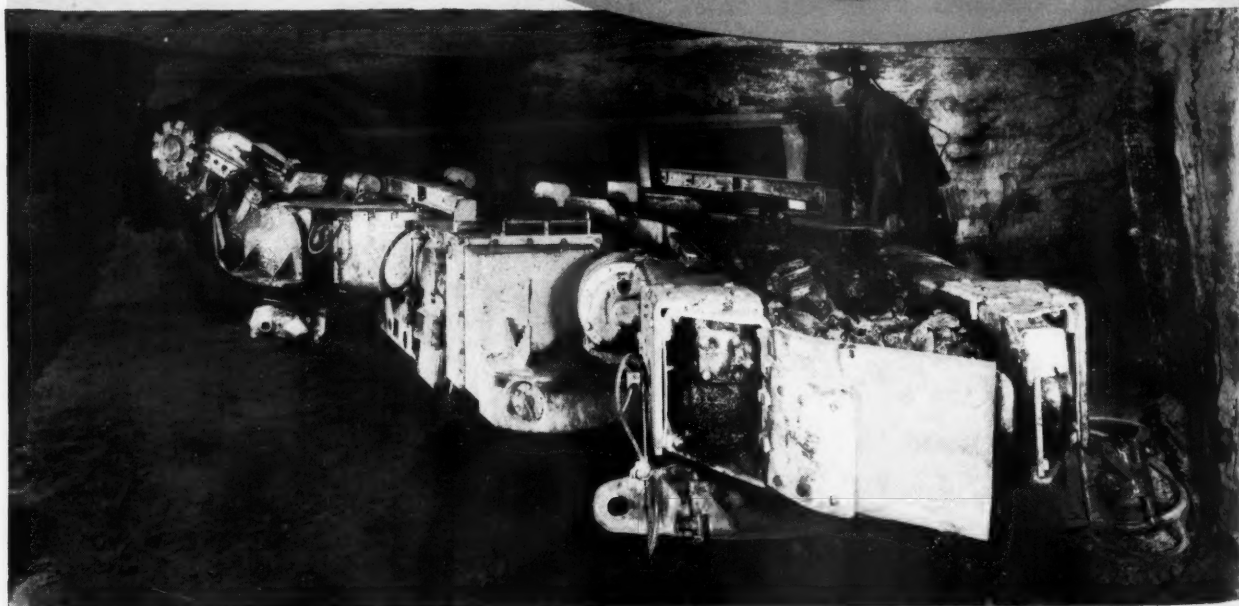
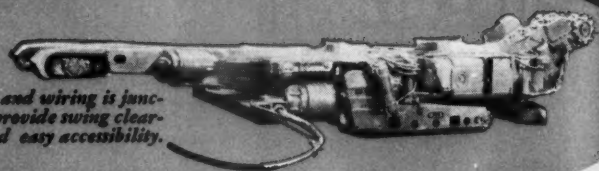


Another step forward in Continuous Mining...



In the 3 JCM-4, positive positioning of ripper bar is provided by hydraulic shear jacks, coupled through the chain for quick response. Operating controls are safely located just behind timber jacks at right rear of machine, so operator always works under timbered roof.

All piping and wiring is junctioned to provide swing clearance and easy accessibility.



HUSKIER

SIMPLER

MORE POWERFUL

MORE RELIABLE

LESS MAINTENANCE

that's the story of the latest model **3 JCM-4 CONTINUOUS MINER**

Joy research and field engineering has done it again! The 3 JCM Continuous Miner, a highly successful unit that's field-proved in mines all over the world, is now available in an improved "Mark 4" model—heavier, more rugged and foolproof, better able than ever to stay on the job and show you new cost savings and production records.

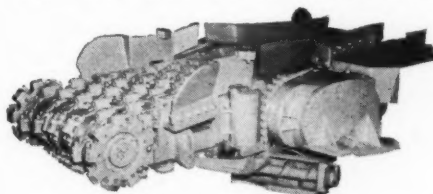
The 3 JCM-4 features a multiple-chain head with bit rings ("pineapples") on each side that cut a clearance path and relieve the load on the outside chains. Permits the use of heavier, stronger, longer-wearing chain, and an increased width of head from 30" to 38¾". The wider head reduces shearing time—each cut is now 30% wider, 39" instead of 30".

Ripper bar gear cases are heavier, and have bevel instead of worm gears—in fact, no worm gears are used for cutting or movement of material. These individual bevel gear drives for ripper head, front and rear conveyor reduce the friction loss of former drives and provide more actual drive power. A 5-foot ripper bar, now standard, offers more chain pitches, smoother cutting and less fly-coal than the former 4-foot bar (5½-foot bar also available). Both the front and rear conveyor drives, and the conveyor flights, have been engineered for greater strength, accessibility and reliability, and longer life.

These and other features put the 3 JCM-4 away out in front in its class. The unit is 34" high for medium seams of 40" and higher; has 2-3 tons-a-minute capacity, depending on seam conditions; cuts vertical paths 39" wide and 18" deep, from 10¾" below to 74" above floor (93" above with 5½' bar); drives entries, mines rooms and extracts pillars; operates in rooms from 11'-10" to 18'-6" wide; turns 12-ft. crosscut 90° from 12-ft. room on a 5-ft. radius; trams 39 feet a minute; successful in coal and, with modifications, equally successful in potash, bauxite, borax and similar materials.

● Let us show you the advantages of the 3 JCM-4 and other complete Joy systems in continuous mining. Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa. In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario.

CONVERSION UNITS AVAILABLE for older model 3-JCM Machines



With a conversion unit, supplied as a complete factory-built assembly, earlier 3 JCM models can be improved and their capacity increased. Installed simply by removing the old unit, sliding in the new, and making the necessary connections.

A complete conversion unit consists of a new G6111 5-chain assembly with bit rings and sideboards, mechanically driven clean-up, bevel gears for both the heavy-duty ripper bar gear cases and the front conveyor drive, redesigned shear jacks and linkage, all assembled on the new sumping frame. • Check with your nearest Joy district office.



Consult a Joy Engineer

JOY

WORLD'S LARGEST MANUFACTURER OF
UNDERGROUND MINING EQUIPMENT

Write for FREE Bulletin 112-4

WSW 6196-112

CONTACT

SPRAGUE & HENWOOD, Inc.

FOR ALL OF YOUR DIAMOND DRILLING NEEDS

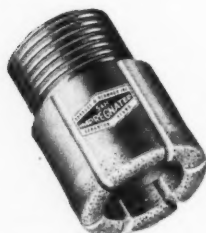


CONTRACT DIAMOND DRILLING ANYWHERE

Many, many firms throughout the United States and the world know the advantages of core drilling; and Sprague & Henwood, with more than 70 years of experience, is the leader in this field. Sprague & Henwood crews have completed thousands of contracts successfully in every conceivable condition. For the best in exploratory core drilling (surface or underground), blast hole drilling, directional drilling, foundation test drilling, grout hole drilling, and pressure grouting—be sure to call Sprague & Henwood. Estimates and suggestions given without charge.



"ORIENTED" DIAMOND
CORING BIT



IMPREGNATED CORING
BIT



"ORIENTED" DIAMOND
"TAPER" TYPE NON-CORING BIT



DOUBLE-TUBE REAMING
SHELL

"ORIENTED" DIAMOND BITS

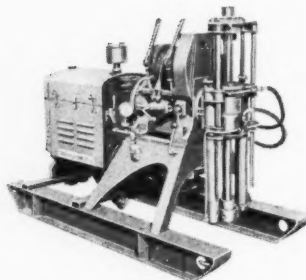
Any bit you buy will work for a while. But if you specify or order Sprague & Henwood "Oriented" Diamond Bits, giving all information on your drilling conditions, you will receive the bit or bits that will do the best job for you. Lower your cost per foot, with a minimum of diamond loss. Write today for

complete "Oriented" Diamond Bit Bulletin #320-1.

RESETTING SERVICE

Send in your bits that need resetting, giving full details of results obtained and conditions under which bits were used. They will be returned new—and "Oriented" to give you less diamond loss and lower your cost per foot.

FIELD TESTED DRILLING MACHINES

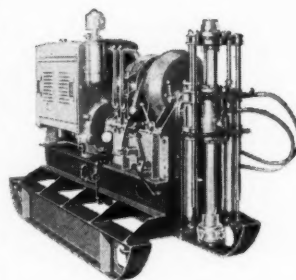


MODEL 40-C
CORE DRILL MACHINE

Field Tested means just that... with contract work being done under every conceivable condition, Sprague & Henwood drilling machines have to perform right. Different sizes and types to meet various conditions are available. Your conditions should be given in detail, and recommendations will be forwarded to you immediately, without cost.

ACCESSORY EQUIPMENT

In addition to drilling machines, and diamond bits, Sprague & Henwood manufactures and can supply you with a complete line of accessory equipment necessary to make up a drilling outfit, such as drill rods, core barrels, casings, fishing tools, etc. A new and most complete Catalog, No. 400, listing all accessory equipment is available to you. Write today for your free copy. It will be mailed promptly.



MODEL 142
CORE DRILL MACHINE

SPRAGUE & HENWOOD, Inc.

SCRANTON 2, PA.



Branch offices: New York • Philadelphia • Pittsburgh • Buchans, Newfoundland • Grand Junction, Colorado

TOUGH HEAVY DUTY MINING CABLES *that have no equal!*

New SUPERTUF JACKET* makes
SUPER SERVICE MINING CABLES
tougher than tough

* General Cable's remarkable
Flame Resistant SUPERTUF JACKET
is a new neoprene compound
processed for maximum lasting
toughness, high density and tensile
strength—extra smooth for wear,
cut and tear resistance.



General Cable... *at your service!*

GENERAL CABLE CORPORATION, 420 Lexington Avenue, New York 17, N.Y. Offices and Distribution Centers Coast-to-Coast



How quickly do Yieldable Arches pay for themselves?

That's the big question, and a natural one to ask before investing in a high-quality roof support like the Bethlehem Yieldable Arch.

The experience of one iron ore mine, extreme perhaps, may be an indication. The conditions were difficult, and the mine had been using timbers 14 in. and more in diameter, practically touching one another. One by one, these timbers failed in from 4 to 6 weeks.

So they installed Bethlehem Yieldable Arch sets in the caving area. Since installation, sets have yielded sufficiently to bring the roof under control, and mining opera-

tions have continued steadily. The operators have conservatively estimated that this installation paid for itself within six months!

While this case is hardly a typical one, this much is sure: in mines having heavy roof conditions the Yieldable Arch will give improved roof support, and will pay for itself gratifyingly soon. That's because no rigid support can indefinitely withstand the dynamic pressures caused by the weight and subsidence of the overburden. Periodic replacement of rigid supports is necessary. The Yieldable Arch, on the other hand, is designed to "give," thus allowing

the ground to relax slowly and form its own pressure arch.

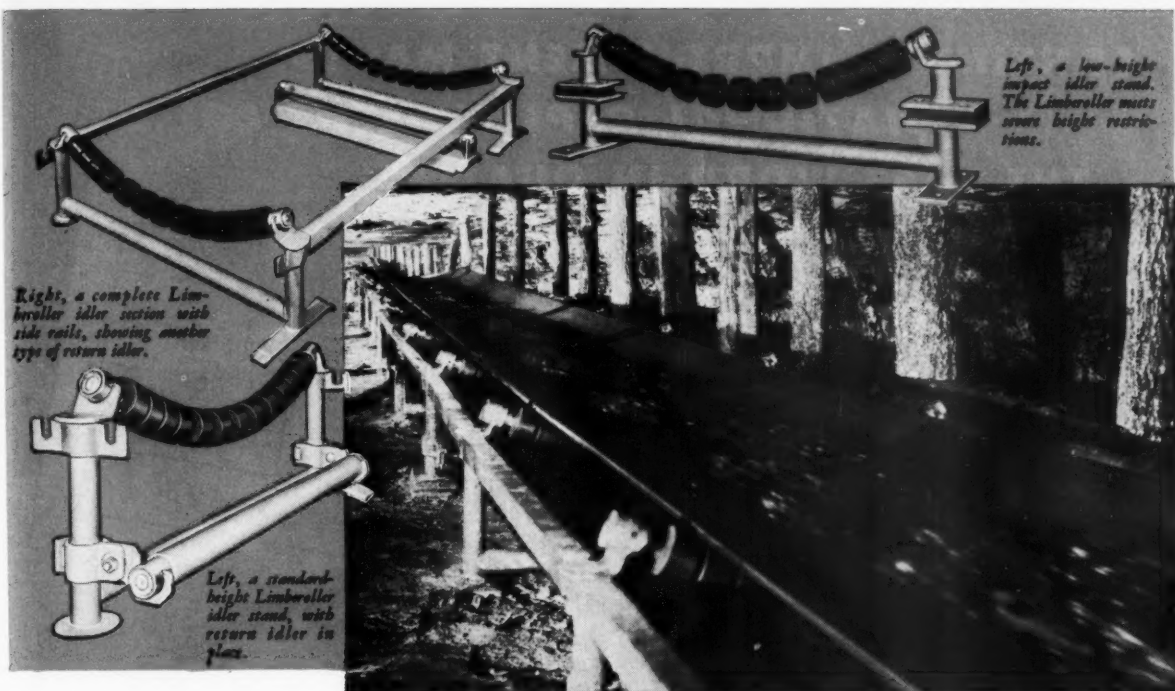
Yieldable Arch sets are recoverable, too, for use elsewhere in the mine. They are easy to install without special equipment or costly supervision. One of our engineers will be glad to talk with you about the Yieldable Arch; you can reach him through the nearest Bethlehem office.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

*On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation. Export
Distributor: Bethlehem Steel Export Corporation*

BETHLEHEM STEEL





JOY LIMBEROLLER CONVEYOR IDLERS SAVE BELTING ELIMINATE SPILLAGE • REDUCE CLEAN UP TIME

Because they install up to eight times faster than solid metal idlers, Joy Limberollers save you money before they carry even a pound of payload. The 36" wide, 3600 ft. long Joy belt conveyor pictured above is installed in a Virginia mine operating in the Norton seam.

The new 36" belt, completely equipped with Limberoller idlers, takes the discharge from three 26" belts. It handles the coal to the discharge end without spillage, freeing clean-up men for other duties.

Limberoller idlers are an exclusive Joy development designed for hard, dirty, continuous underground service. Each idler is a single roller consisting of a series of neoprene discs molded in one piece on a core of flexible steel cable. There are

- Follows mine bottom, withstands greater misalignment.
- No spillage, centers the load and shapes to it.
- Easy to extend or retract—to handle, store and haul.
- Less time and easier to set up, knock down and move.
- No lubrication needed, no bolts or cover sheets required.
- Fewer idlers required: spaced at least 50% further apart.
- All components can be transported on the belt.

only two self-lubricated bearings per idler—one at each end, up out of the dirt.

Thousands of Limberollers are in highly successful use today. At this mine, officials say they're well pleased, both with no spillage and with the open construction of section frames that permits easy inspection. Since starting up the belt in early Autumn, 1955, they've had no trouble, no failures, no maintenance. Production rates are improved, and belt life is increased more than 20% due to better troughing and reduced shock on the belt by the Limberollers.

There's just one best answer to belt conveyor problems—and that's the Joy Limberoller idler. Let us work with you. Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa. In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario.

- No worry over which end of conveyor sections goes in first.
- Less friction to start up, only 1/3 as many bearings.
- Only 1/3 as heavy as steel idlers, easy to change.
- Ideal for hard-to-get-at locations—put it in and forget it.
- Less belt wear, longer life.

Write for FREE Bulletin 125-3



Consult a Joy Engineer

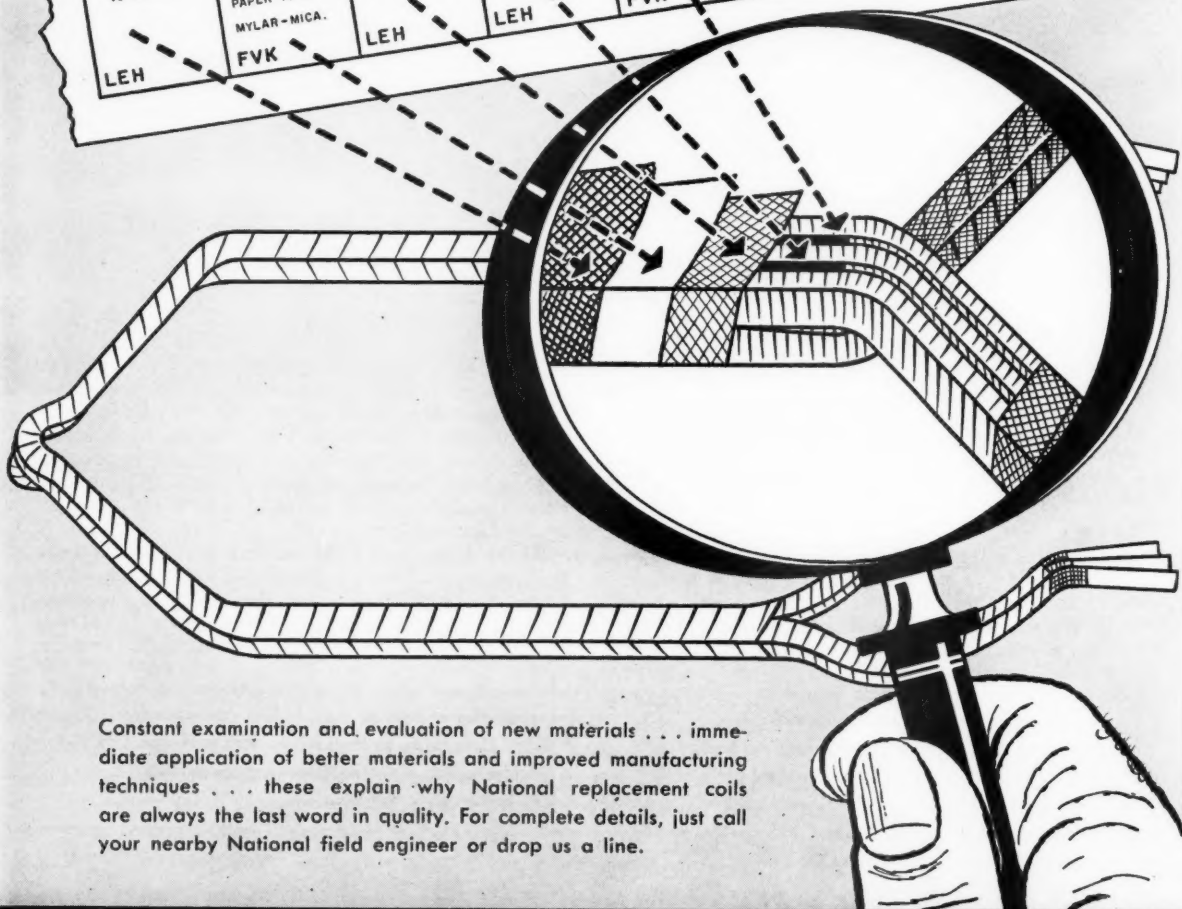
WSW-CL-6250-125

JOY

WORLD'S LARGEST MANUFACTURER OF
UNDERGROUND MINING EQUIPMENT

CONTINUAL IMPROVEMENT MAKES NATIONAL REPLACEMENT COILS THE LAST WORD IN QUALITY

REVISIONS					Core Data Furnished By: FVK 3/25/52	
4-20-56	6-23-55	4-12-55	8-16-54	5-22-56	SHEET: / OF /	NATIONAL ELECTRIC COIL COMPANY BLUEFIELD, W. VA. COLUMBUS, OHIO
CHANGED VARNISH FROM 2A120 TO-2A220.	CHANGED WRAPPER FROM .007" MICA ROPE PAPER TO .008" MYLAR-MICA.	CHANGED FROM 8A48 MICA TAPE TO SIL. BOND 8A96.	CHANGED FROM S. PAPER STIFFENERS TO S. GLASS.	CHANGED FROM DFG WIRE TO SILICONE DOUBLE DACRON GLASS.	Approved: <i>PEH</i> 3/27/52	
LEH	FVK	LEH	LEH	FVK	Drawn by: FVK	Date: 3/25/52
					Traced by: LW	DWG. NO. 101-496



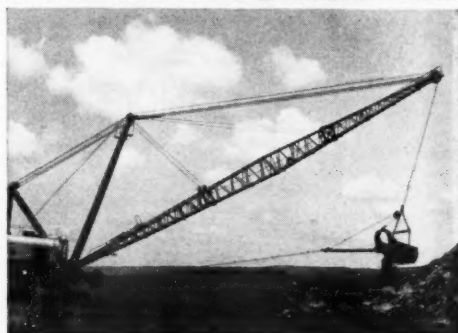
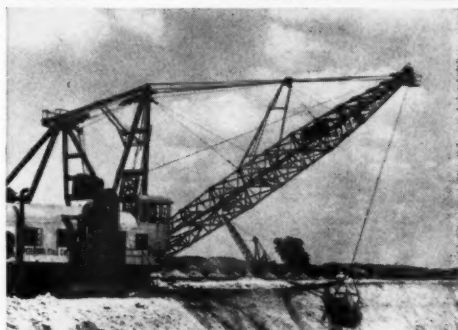
Constant examination and evaluation of new materials . . . immediate application of better materials and improved manufacturing techniques . . . these explain why National replacement coils are always the last word in quality. For complete details, just call your nearby National field engineer or drop us a line.

NATIONAL ELECTRIC COIL COMPANY

COLUMBUS 16, OHIO, U. S. A.



ELECTRICAL ENGINEERS: MAKERS OF ELECTRICAL COILS AND INSULATION—
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Macwhyte Internal Lubrication gives you rope prepared especially for your service conditions—designed to resist abrasion, internal friction, and corrosion



Macwhyte PREforming gives MONARCH WHYTE STRAND the flexibility for improved handling and long service. There's a type and size for all drag line equipment.

Here's special rope ...made for mining!

Monarch Whyte Strand wire rope is available in the correct type and size you need for your equipment. This rope is made by Macwhyte to give you long, heavy-duty service on draglines, strip shovels, mine hoists, slope hoists, mining machines, loaders, and other mining equipment.

Monarch Whyte Strand is supplied properly PREformed for flexibility, and properly lubricated, depending upon the use of the rope, to resist abrasion, corrosion, and give maximum service.

Give Monarch Whyte Strand a chance to serve you. You will be more than pleased with its performance. Your Macwhyte distributor is stocked for immediate delivery.

Monarch Whyte Strand Bulletin 5425 is available from your distributor or write direct to Macwhyte Company.

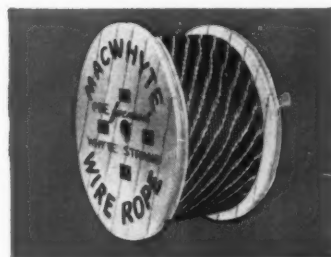
MACWHYTE MINING ROPE

Macwhyte Company, 2952 Fourteenth Avenue, Kenosha, Wisconsin

Manufacturers of: Internally Lubricated PREformed Wire Rope, Braided Wire Rope Slings, Aircraft Cables and Assemblies, Monel Metal, Stainless Steel Wire Rope, and Wire Rope Assemblies. Special catalogs available.

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Distributors conveniently located throughout United States



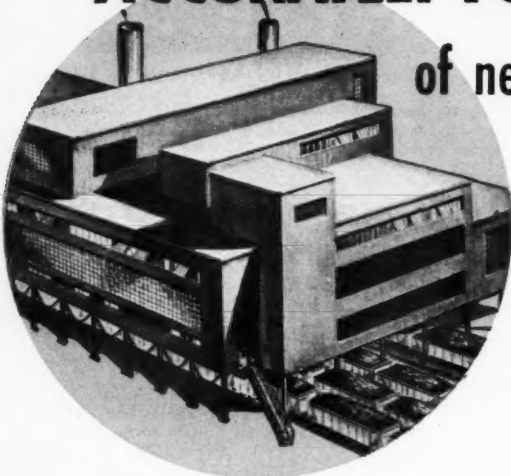
MONARCH WHYTE STRAND is made by Macwhyte in every wire rope classification to provide the correct size and construction for all strip mining machines.

1007H

This Wilmot
Commercial-Size
Pilot Plant
Helps You to...



ACCURATELY FORECAST PERFORMANCE of new preparation equipment or plant



Our Pilot Plant Enables You to Solve Feed, Yield and Product Problems in Advance

In the new Wilmot pilot plant, pictured above, you can see commercial size equipment actually cleaning truck or carload samples of your feed. Also located here is a modernly equipped coal laboratory. Both are staffed by technicians with many years experience in coal preparation. We believe you will, like an increasing number of operators and engineers, find these facilities extremely valuable in helping you: (1) solve technical and design problems; (2) predetermine the yield and quality of the products.

Wilmot Builds Complete Preparation Plants or Single Equipment Units

For nearly 50 years, Wilmot has been designing, building and equipping coal preparation plants exclusively. A wealth of engineering and construction experience is available to you, whether your requirements are a single unit of replacement equipment or a complete plant. Wilmot furnishes the following types of coal cleaning equipment: heavy-media, cone cleaner, classifier, froth flotation. We invite your inquiries.



WILMOT-OCC HEAVY-MEDIA VESSEL.
U. S. and for. patents pending,
The Ore & Chemical Corp.

WILMOT ENGINEERING CO.

HAZLETON, PA.
Plant:
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here's a
Wagon Drill that
really gets around!



the G-800 Tracdril

- Self-Propelled
- One-man
Operated
- Tows Own
Compressor

Combine the drilling speed of the hard-hitting CP-70NDC Drifter with the adaptability of a CP Drill Carriage and U-arm... add the maneuverability of a self-propelled track-mounting that tows its own air supply over rough terrain... and you have the One-Man CP Tracdril.

Reversible tramming motors enable the Tracdril to go forward, backward and pivot

... for faster "moving time" from hole-to-hole, more accurate spotting and more time for productive drilling. "Knee-action" tracks keep the hydraulically operated U-arm support level when operating on uneven ground. The Tracdril has plenty of reserve power... can tow a 13,000 pound CP 900 c.f.m. Rotary Compressor up a 10% grade. For details see your CP equipment distributor.



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PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES



Most mines can Roof Bolt **Effectively and Profitably....**

WHILE each mine may be different in physical characteristics, in method of operation or types of equipment used—all mines have one problem in common—the problem of keeping the roof in place.

Hundreds of mines, with all different kinds of roofs, have proved that roof bolting is the best form of roof control. They have also found that bolting leads to increased safety, better ventilation and greater production efficiency. Roof bolting offers so many profitable production advantages it justifies any mine, now using conventional timbering methods, making comparative roof support tests. Bolting tests can be made at very little cost.

To be as effective as possible—roof bolting calls for thorough knowledge of the roof strata—well planned bolting patterns and cycles—proper selection of bolts and shells—an adequate supply and service program. Being "The Pioneer in Roof Bolting"—PATTIN MFG. COMPANY, staffed with experienced roof bolting, mining engineers, is capable of meeting every requirement for quality products and service. Your phone call or letter will get immediate attention.

Shown above is the outstanding PATTIN style D-1 expansion shell. Samples of the "D-1" or "D-2" shells will be furnished upon request.

In Western States

PATTIN expansion shells are available and serviced exclusively through Colorado Fuel and Iron Corporation, Denver, Colorado. Western mining companies may contact them direct for information and consultation.

PATTIN

"68th Year"

MANUFACTURING COMPANY
MARIETTA, OHIO



**Mack Exhibit
at
Booth No. 134**

at the 1956 mining show— climb aboard this big MACK...

... Mack's LRVSW, an off-highway dumper that combines mammoth size with brute strength . . . 34-ton capacity, 400 h.p. diesel engine, exclusive Balanced Planidrive bogie, four-speed overgear transmission coupled with a single-stage hydraulic torque converter, plus many more outstanding features . . . a dumper whose stamina and performance assure minimum haulage costs for your big jobs.

When you have inspected the super-capacity LRVSW, let us give you the facts on Mack's complete line of off-highway vehicles . . . the largest selection in the industry. You'll find a heavy hauler to suit every large earth-moving job . . . a hauler that will give you top performance, outstanding economy, maximum dependability — qualities that have made Mack the acknowledged heavy-duty truck leader of

the industry.

Get the full details at the Mining Show in Los Angeles, October 1-4, or contact your local Mack representative. Mack Trucks, Inc., Plainfield, New Jersey. In Canada: Mack Trucks of Canada, Ltd.

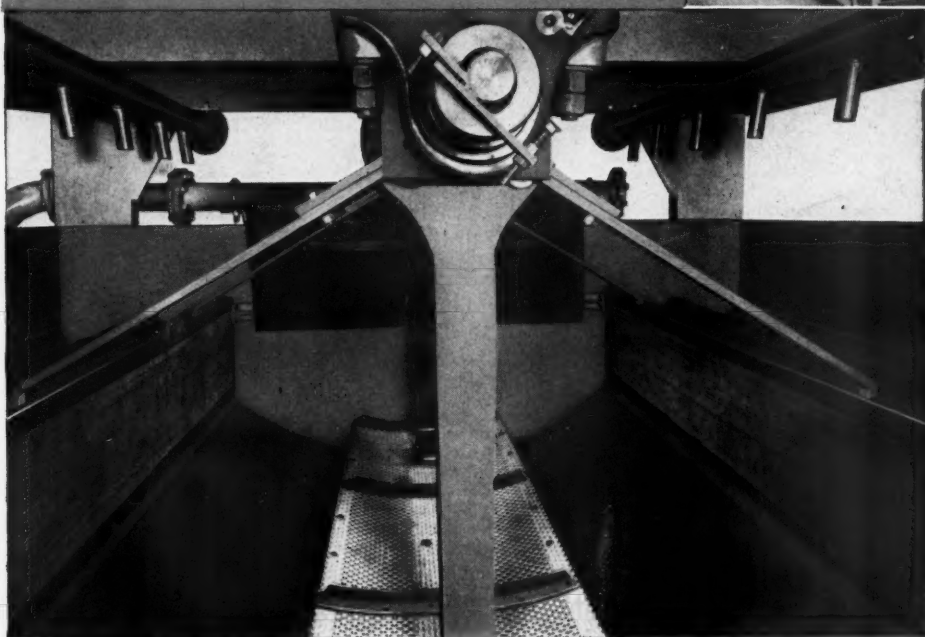
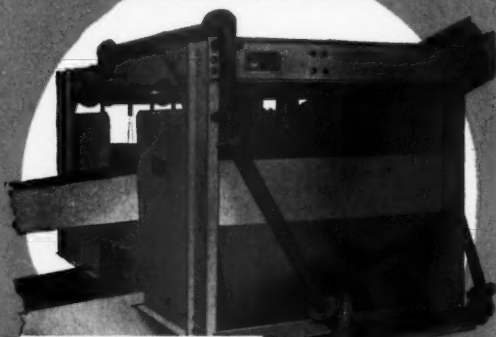
MACK
first name for
TRUCKS

4399

NOW...BETTER HM SEPARATION

with OCC Vessel

because of its large
productive pool area



Left, view of the interior of the OCC Heavy Media Vessel, illustrating its large pool area; view is from discharge end of vessel. Above, exterior view: float and sink discharges on left and feed chute on right.

U. S. and Foreign
Patents Pending

Simplicity of OCC Vessel Introduces Broad Operating Economies

Since the introduction of the Heavy Media process, the development of a separator whose simplicity would match that of the process has been an aim. This has been achieved through the design of the OCC Vessel illustrated above. The rake suspended in the center oscillates the width of the vessel. In so doing, it maintains in productive use practically the entire volume of the vessel, in contrast to other separators employing only a fraction of same. The result is improved metallurgy and increased economy.

The remarkable simplicity of the vessel is pointed up by the fact that the rake, the only moving part in the vessel, performs not only the function of removing the sink but also that of keeping the medium in suspension. Let us send you details of how the OCC vessel can increase your operating profits, and reduce maintenance costs in an HMS plant.



*See Working Model at Booth 401
Los Angeles Mining Show*

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Royal Blue rope
is made of the *toughest*
rope wire ever developed...
Roebling Type 1105



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PRE-BILT
sectional belt conveyors
for



Link-Belt conveyors efficiently stock and reclaim four sizes of sand and gravel at one of the industry's most modern yards.

EASY SELECTION... QUICK DELIVERY

Order from nearest of
9 plants—reduce
costs and delays

HERE'S today's top answer to efficient, economical, long-life bulk handling — Link-Belt PRE-BILT sectional belt conveyors. They combine standard products, sectional truss frames and supporting bents to meet your exact requirements. Let a Link-Belt representative help you choose from 27 standard, packaged components — with drives up to 40 hp . . . 18, 24, 30 and 36-in. belt widths . . . 24 and 42-in. truss depths. For the full story, call your nearest Link-Belt office.

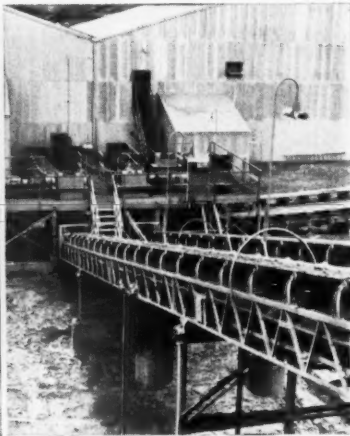


Book 2579 outlines Link-Belt PRE-BILT sectional belt conveyor advantages. Write for your copy today.

LINK-BELT
BELT CONVEYOR EQUIPMENT



Inclines like this pose no special problems for highly-adaptable Link-Belt PRE-BILT sectional belt conveyors.



Conveyor with 30-in. wide belt handles iron ore concentrate and tailings from washing plant to loading hoppers.

FROM SELECTION TO OPERATION... AS SIMPLE AS THIS

EASY SELECTION. Your Link-Belt representative will help you select the best combination of PRE-BILT sectional belt conveyor components.

PROMPT QUOTATIONS. He will prepare a comprehensive and accurate estimate of requirements for installations that permit "on-the-ground" survey.

SIMPLIFIED PURCHASE. Parts are standardized, interchangeable, all available from one supplier. Link-Belt representative can furnish all necessary data.

QUICK DELIVERY. PRE-BILT conveyors are built at nine strategic locations and are shipped from the plant nearest you.

FAST INSTALLATION. Can be readily handled by your own erectors in most cases. Link-Belt can also furnish complete erection service and supervision.

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

14,119



*Longyear...
complete service to
the mining industry*

From advance reconnaissance to mine development... look to Longyear for complete service

DIAMOND CORE DRILLS

Research and development have put Longyear diamond core drills, equipment and supplies in demand by mining men everywhere. The Longyear Wire Line Core Barrel shown on this page is one example of Longyear's forward-looking policies in the development of drilling equipment.

CONTRACT DRILLING

High core recovery at minimum cost is the standard successfully maintained by efficient Longyear drill crews on the job. Exploratory drilling, foundation testing, soil sampling, and grout hole drilling are some of the services available to you through the Longyear Contract Drilling Division.

GEOLOGICAL, MINING CONSULTING

Longyear's full staff of geologists and mining engineers can provide you with professional assistance in every phase of your operation—from advance reconnaissance to mine development.

Visit our exhibit at Booth No. 432
American Mining Congress MINING SHOW
Los Angeles, California October 1-4



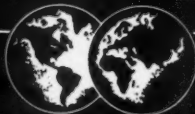
Using the Longyear Wire Line Core Barrel, this drill crew is able to obtain excellent core samples *without* pulling the entire string of drill rods after each core run. This drilling tool is revolutionizing exploratory diamond core drilling.



This Longyear contract drill team knows how to get good core samples with a minimum of time on the job. Highly trained Longyear crews using modern equipment are available for short or long-term drilling assignments in any part of the world.



These Longyear geologists are conducting a magnetometer survey. Longyear maintains a full staff of geologists and mining engineers to provide assistance as you require.



Diamond Core Drill Manufacturers
Core Drilling Contractors • Mining
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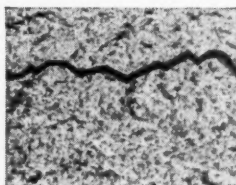
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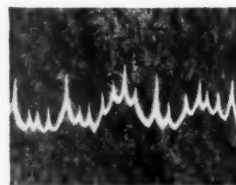
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The BECOLOY fracture surface at right shows the tough, fibrous structure that imparts high strength to this alloy. Ordinary steel fracture surface, at left, has a coarse, crystalline pattern.



19R56



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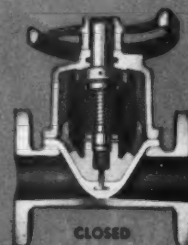
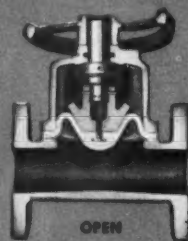
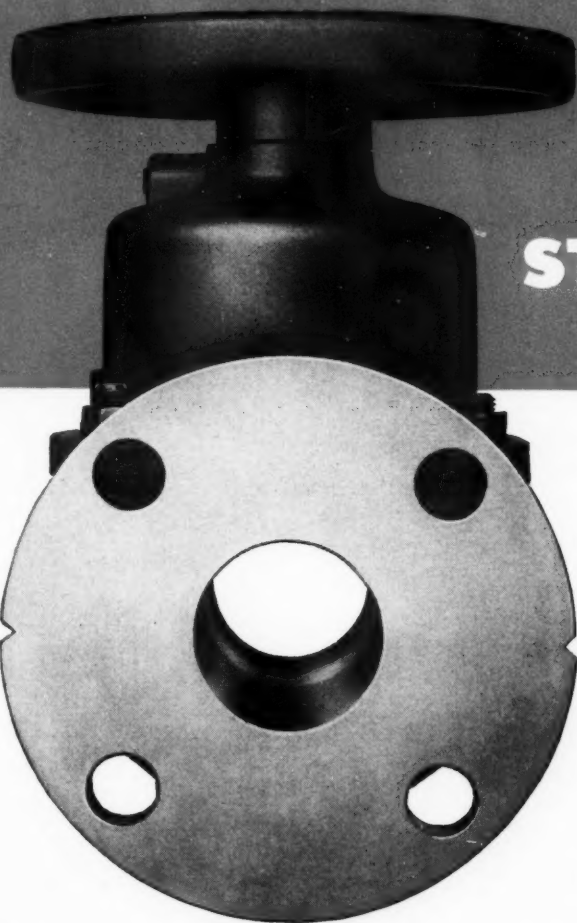
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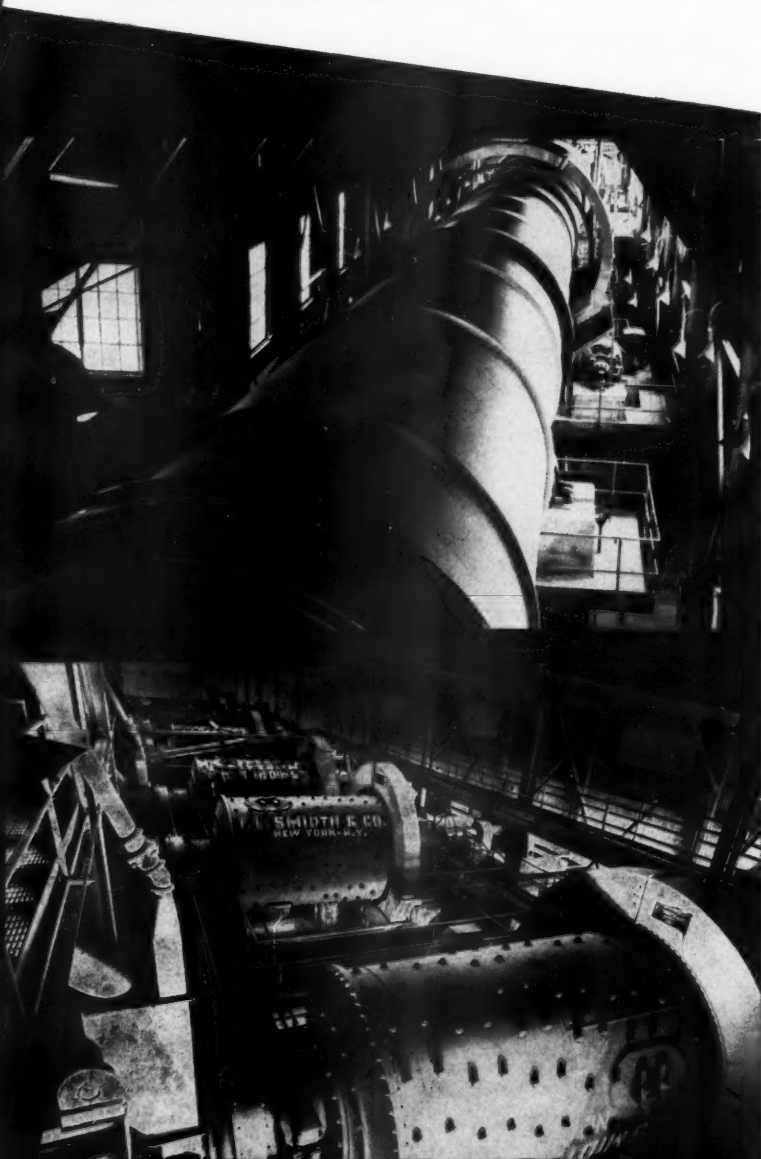
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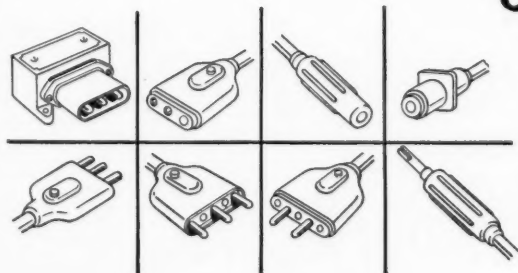
CABLE VULCANIZERS . . . for rubber, Neoprene, Buna S and thermoplastic jacketed cables. Simple in operation, JOY vulcanizers quickly pay for themselves by making it possible to repair cuts and breaks in vital portable power lines immediately. Two types are available—"Steam" and "Direct Heat." Both are heated electrically with automatic temperature controls. Bulletin B48a describes these vulcanizers in detail and lists molds vs. cable sizes. Ask us for your free copy.



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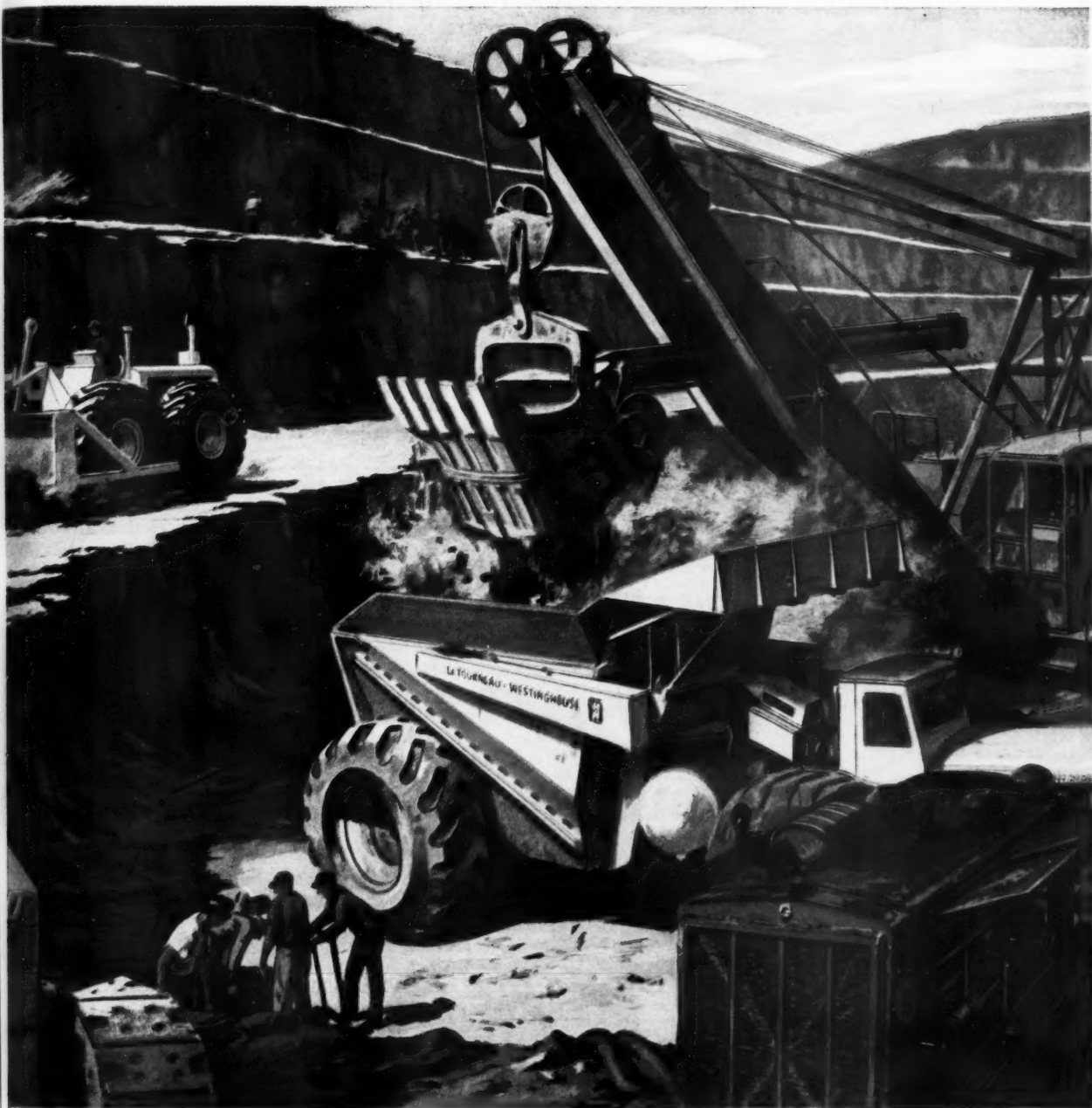
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STYLE D BITS

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STYLE DB BITS

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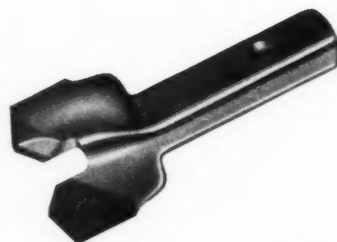


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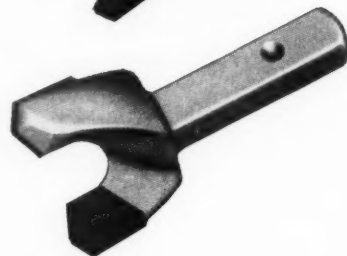
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✻ Editorials ✻

ROBERT W. VAN EVERA, *Editor*

SEPTEMBER, 1956

Through Experience of Others

ANOTHER A. M. C. Mining Show is at hand. Thousands of mining men from all branches of our industry will gather in Los Angeles and come away richer in knowledge of the most important practices and problems relating to their job of extracting and processing the mineral wealth of the nation. The large attendance at these annual meetings demonstrates that men in industry generally are anxious to take advantage of the opportunities afforded by this convention and exposition to broaden their understanding of industry problems and policies, techniques and equipment, and interrelations of the various phases of mining.

MINING CONGRESS JOURNAL has observed a considerable tendency, among many in the industry, to be unduly preoccupied with their own jobs or their own localities. High proficiency in a specialized area is certainly commendable. But the highest attainments come through a combination of technical competence and the exercise of broad imagination based on knowledge that has been put in practice by others in related fields.

It is our contention that you can improve your own operations faster by keeping up to date on practices and policies in the other branches of the mining industry. Extraction of mineral resources is the common denominator that should draw together miners from all areas, working in all types of minerals. Metal mining men, coal miners, industrial minerals producers, all have profited from the others' experiences. An even freer exchange of technical information would result in an accelerated rate of advance for the minerals industries. The details may vary between areas and minerals, but the principles of extraction are constant.

Civic Responsibility

THE engineering professions receive, and deserve, a large measure of credit for the material progress that has been achieved in the present age. They have obviously had a leading part in all major scientific and technological advances. It has been observed that, as individuals, those trained in engi-

neering and production possess a higher I.Q., get into less financial and legal difficulties, and live happier domestic lives than the average American citizen. Mining engineers as well as supervisors, foremen and technicians in our industry fall into this category of select citizens.

Yet one thing bothers us about the habits of this group. Do they exert their influence toward an improved world as broadly as they should—in proportion to their abilities? Scientifically and productively they're doing fine, but in other fields there may be room for improvement.

Politics and Government have great need for the straight thinking and logical planning of the engineer and production man. It is understandable that technical men may want to stay clear of any sort of politics and instead concentrate on the work for which they were trained and which they enjoy. Result—they become politically inert.

But Government has grown so large and its influence so broad that every citizen is in politics whether he likes it or not. When highly qualified men fail to recognize this they are kidding themselves. The ultimate result could be serious.

An Employee Relations News Letter put out by General Electric Co., for circulation among its management, focused on a similar situation under the title, "Political Helplessness of Business Hurts Everybody." A program was put forth to remedy the political ineffectiveness of businessmen, based on two courses of procedure: (1) "Deserve and Get Public Support" and (2) "Influence Votes."

Although business as a whole may have more at stake than engineers and production personnel, the two have much in common. As to deserving public support, mining men have no great problems—but getting such support is another matter. This requires that they become spokesmen—to tell the true story of their actual contribution to the well-being of the Nation.

The General Electric article summed up Part 2 of its program, "Influence Votes," in the sentence, "It is a nonpartisan program of publicly and effectively supporting what is in the public interest and opposing what is not."

It is becoming ever more important that the technician's talents and training be brought to bear at the polls as well as on the job.



Standard earth moving equipment is being used to remove approximately 9,000,000 tons of overburden from the operational area of this boron mine at Boron, Calif.

A New Look at United States Borax & Chemical Corp.



Higrade Muriate Refinery near Carlsbad, N. M. United States Potash Co., division of United States Borax & Chemical Corp., recently completed a \$3,000,000 expansion program at the refinery and mine to increase the production approximately 20 percent.

By HORACE M. ALBRIGHT

Director
United States Borax & Chemical Corp.

UNITED STATES Borax & Chemical Corp. was formed to consolidate the management of the mining and refining operations of the two long established mining companies, Pacific Coast Borax Co. and United States Potash Co. United States Borax & Chemical Corp. is now engaged in the mining, refining, and marketing of borax and potash. The company maintains administrative offices at Los Angeles where its over-all affairs

pansion program is presently under way for the conversion and construction of new concentrating and refining plants to handle the boron ores which will be obtained from its open pit mine.

At the present time, standard earth moving equipment is being used by Isbell Construction Co. to remove approximately 9,000,000 tons of overburden from the operational area. The open pit will be developed along

The recent merger of Pacific Coast Borax Co. and United States Potash Co. into United States Borax & Chemical Corp. finds the famous 20-Mule Team headed towards more progressive mining and refining methods to obtain better recovery of the two basic minerals which it mines—borax and potash

are under the direction of president, James M. Gerstley, and vice-president and general manager, Patrick J. O'Brien who together formerly headed the Pacific Coast Borax Co. The facilities for its research division headed by George A. Connell will be located at Anaheim, Calif. The 20-Mule Team Products Division headed by D. V. Parker will continue to be responsible for package sales of household and industrial cleaning materials.

The two principal operating divisions of the corporation are the Pacific Coast Borax Co. Division headed by J. Frederick Corkill and the United States Potash Co. Division headed by Dean R. Gidney.

Change to Open Pit Methods

The Pacific Coast Borax Co. Division is engaged primarily in the mining and refining of borate ores and the production of borax, boric acid and inorganic boron compounds from its mine at Boron, Calif. Perhaps the biggest change in its operations has been the conversion of its borax operations at Boron from underground to open pit mining. An \$18,000,000 ex-

fairly standard procedures in that bank slopes of $1\frac{1}{2}$ to 1 will be maintained while 50-ft high benches of ore will be drilled by auger drills and blasted for loading by three-cu yd electric shovels into 24-ton dump trucks.

During preliminary operations, primary crushing will be carried out at the surface but in subsequent operations the primary crusher will be moved into the pit. Materials will then be delivered by dump truck to the crusher and then conveyed by belt to the surface.

To maintain the open pit equipment, a special maintenance machine shop will be erected near the plant site.

Refining of Borate Ores

Due to the physical stratification of the borates and clays comprising the ore body being mined, new procedures had to be followed to insure uniform and proper boron oxide percentages in the refinery feed. Once the four-in. material has passed the primary crusher, the ore will be stacked in long piles approximately 800 ft in

About the Author



A native of California, HORACE M. ALBRIGHT was admitted to the bar, District of Columbia and California, in 1914.

His early career included service in the Interior Department under Secretary Franklin K. Lane. He became interested in the National Parks, and for ten years was superintendent of Yellowstone National Park, subsequently being appointed director of the National Park Service.

When United States Potash Company, the first of the large potash producers in the Carlsbad area, went into operation, Albright was selected as vice-president and general manager, and for the past ten years has been president and general manager of the company.

Albright is a director of the American Mining Congress, American Potash Institute, Potash Export Association, and chairman of the American Planning and Civic Association. He was a member of the Natural Resources Committee of the Hoover Commission on Government Reorganization, and the National Minerals Advisory Council.

Now retired, Albright's services are still available on a consulting basis to the United States Borax and Chemical Corp.

length and 40 ft in height by a rail mounted ore stacker for bedding and blending. From the piles, the ore will be mechanically fed by vibrating feeders to a subterranean belt conveyor for delivery to the fine crushing plant. There a hammermill operating in a closed circuit with a vibrating screen will reduce the four-in. ore to less than $\frac{3}{4}$ in. Then an inclined belt will transfer the ore to the fine ore storage system bins prior to controlled feeding to the dissolving plant. The dissolving plant will consist of a series of steam jacketed, mechanically agitated tanks containing steam coils which cause the sodium borate content of the ore to dissolve in a mother liquor and the clay insolubles to be suspended. The solution from the dissolving plant then will be subjected to a thickening treatment in a counter-current decantation system where the clay will be removed. The resulting clear borax solution will be passed



J. M. Gerstley



D. R. Gidney



J. F. Corkill

(LEFT TO RIGHT) J. M. Gerstley, president of the United States Borax & Chemical Corp.; Dean R. Gidney, vice-president and general manager of the United States Potash Co., division of the United States Borax & Chemical Corp.; and J. Frederick Corkill, vice-president and general manager of the Pacific Coast Borax Co., a division of the United States Borax & Chemical Corp.

through clarification filters and pumped to vacuum crystallizers after which the crystals will be separated by means of automatic centrifugals. The crystal products will then be dried and passed to the storage facilities or diverted to other uses.

The plant area after the planned expansion will be approximately 80 acres. The thickeners which will be constructed in the countercurrent decantation system will be the largest covered thickeners in the world. Two of the thickeners, for instance, could not be placed in the Los Angeles Coliseum.

Mines Potash in New Mexico

United States Potash Co. Division of United States Borax and Chemical Corp. mines and refines potassium chloride near Carlsbad, N. M. The mine is located approximately 24 miles northeast of the city of Carlsbad and consists of three shafts approximately 1000 ft deep. The number 1 and 2 shafts are used for mining the original ore body found by the Snowden and McSweeney Co., oil operators, 29 years ago while drilling for oil in the Permian Basin of New Mexico.

The ore is mined underground by the room and pillar method. Approximately three-fourths of the ore is mined by blasting after undercutting with universal undercutters and drilling with hydraulic jumbo drills. The broken ore is loaded by Joy 11BU electric powered loading machines into 11-ton electrically powered rubber-tired shuttle cars for haulage to the loading head. There the ore is dumped into the mine cars for haulage to either number 1 or 2 shaft where it is hoisted to the surface.

The other 25 percent of the ore is mined by continuous miners which are powered by electricity. A revolving chain cutter head removes the ore from the face onto extensible conveyor belts where it is diverted to a main panel belt for transfer directly into mine cars which deliver to either the

number 1 or 2 shaft for hoisting to the surface.

Haulage

All underground haulage is done by locomotives and mine cars from loading heads. In the older original mine this is done by trolley locomotives and in the newer "B" ore body by 40-ton diesel electric underground locomotives.

The ore on arriving at the surface is crushed to a minus four mesh size and transported over screens which remove certain sizes for metallurgical separation to obtain a 60 percent granular material. The balance of the minus four mesh material is loaded into 40-ton hopper cars and hauled 16 miles over the narrow gauge tram road by tandem 70-ton diesel electric locomotives. The ores are processed in the refinery by a hot solution and recrystallization method to obtain a

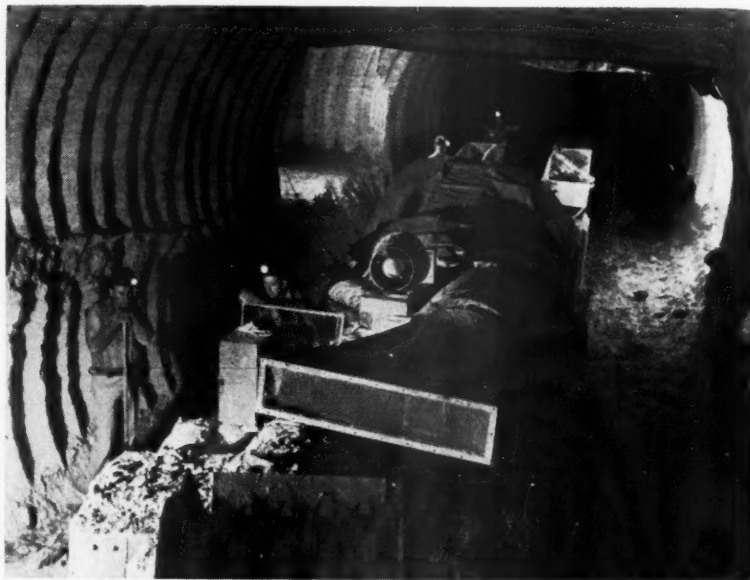
white high purity muriate. All storage, loading and shipping is handled at the refinery.

\$3,000,000 Expansion Program

United States Potash Co. Division has just completed a \$3,000,000 expansion program at the refinery and mine to increase the production approximately 20 percent. It is presently completing the mining facilities at a third shaft which is approximately six miles north of the original shaft, and expects to have the northernmost ore body in operation shortly after the first of the year. That ore body will be mined with continuous miners and conveyor belts only. The ore after arriving at the surface at shaft number 3 will be hauled over a company-owned road from shaft number 3 to shaft number 1 by 50-ton pay load diesel trucks for processing at the refinery.

United States Potash Co. Division is presently constructing a new 100,000-ton storage warehouse at the refinery site to be better able to serve its customers on a seasonal basis. There is also under construction at the refinery a new chemical plant that will produce potassium chloride of high purity. In addition, the Division is constructing at the refinery a new Granular Muriate plant for the production of white high purity granular product for agricultural use.

The Potash Division is currently prospecting in the Saskatchewan, Canada, basin where extensive underground deposits have been located at depths greatly in excess of the present Carlsbad, N. M., deposits.



Continuous miners are used at the Jenifer Mine, Boron, Calif.



Ventilating and power conversion equipment requires the best obtainable maintenance program

Maintenance of Ventilating and Power Conversion Equipment

A summary of the maintenance program at a large underground coal mine, this report gives "how and why" information on training repairmen, allocating specific duties to individuals, standardizing equipment and building and scheduling preventive maintenance. The importance of proper tools and repair materials is stressed

By B. R. WALBURN

General Master Mechanic
J. & L. Steel Corp.
Vesta-Shannopin Coal Div.

MAINTENANCE has grown to major importance in all phases of coal production. The maintenance of ventilating and power conversion equipment, in general has received its full share of attention in the past because of the relatively vital role that is played by each, but, with the increasing importance of all units in a continuous production line, there are certain aspects in their maintenance that can bear closer examination.

Our set-up probably will differ very little with any of comparable size, in that we believe an ounce of prevention is worth a pound of cure and when a cure is effected, to get rid of make-do connection as soon as possible.

Perhaps it would be well, at this point, to mention that we have in

operation ten motor generator sets and 12 mercury arc rectifiers operating at 600 v dc, together with three centrifugal and five aerovane fans, driven by 2300 v ac motors ranging in size from 300 to 450 hp. This equipment, distributed over 11 substations, three of which are manned by hoisting engineers and the balance being unattended, requires the best obtainable maintenance program.

Substation Attendants are Trained for Maintenance

The three engineers at each of the attended stations, are individually responsible for the daily shift performance of all the equipment at that location, but each man is also assigned a specific type of equipment—one the

hoist, another the conversion units and the third the ventilating fans—as his direct responsibility for the units weekly, monthly, and yearly servicing in order that we might have a more direct control over periodic maintenance.

All of the other stations, at which no personnel is permanently attached, are visited once daily by a service man who checks the equipment in operation, sees to its periodic servicing and makes minor repairs and adjustments as may be necessary. In addition to the men already mentioned, individuals and crews from the general machine shop are trained to assist the daily service man in fulfilling his periodic servicing or to take his place when he is absent.

In this manner we now have

trained a sizable crew of men, covering all shifts, who have familiarized themselves with the following:

- (1) Substation power and control circuits and their protective breakers.
- (2) Relay locations, functions, setting and adjustment.
- (3) Fuse location and size.
- (4) Fan blade positioning.
- (5) Belt care and splicing.
- (6) Type, grade, and amount of lubricants.
- (7) Location and quantity of spare equipment and parts.

Standardized Equipment

In order to reduce the amount of training and experience this entails, we have, over a period of years, tried as much as possible to standardize equipment, substation design, and even the location of switches, equipment or spare parts within the sta-

Under maintenance through normal servicing falls the daily, weekly, monthly, and yearly checks pressures, temperatures, water levels, lubrication, hipotting of transformer and breaker oil, meggering of high voltage cables, meggering of grounding mats, visual inspection for worn or broken parts and tightening of loose equipment.

Maintenance through construction and re-construction covers the construction of more efficient grounding mats, more effective lightning arrestors, replacement of parts subject to failure with heavier components or redesigning equipment to make parts subject to more wear accessible for speedier replacement.

Maintenance through planned system operation, of equal importance with the others but less used, can do much to further an over-all maintenance program. It is here that



As the underground workings move forward, so do the air and power requirements. In large mines this requires a close tie between the operating and maintenance departments for proper planning and coordination

tion. All of which tends to make a simpler and, therefore, easier system to follow.

The maintenance of ventilating and power conversion equipment, similar to all other maintenance, can be divided into breakdown and preventive maintenance. We all try to hold breakdown repairs to a minimum because of production delays and the high costs which are associated with them, but because of faulty parts or more likely excessive stresses applied to the system during emergency conditions, breakdowns can never be eliminated completely.

It is in the line of preventive maintenance that we feel larger dividends can be realized. This subject may be sub-divided into maintenance through (1) normal servicing, (2) construction and re-construction and (3) planned system operation.

knowledge of past performance of the equipment, load charts to determine present operation and information on future development and practice are utilized to keep a system operating most effectively.

Normal Servicing

A detailed discussion of these various points probably will show just what more is encompassed by them. The following items are covered by maintenance through normal servicing for a ventilating fan:

Hourly

- (1) Inspect all fans and motor bearings.
- (2) Inspect and compare water gauge with chart.
- (3) Inspect bearing temperature recording or indicating instrument.

Daily

- (1) Test fan signal for operation.
- (2) Inspect brushes for wear and arcing at collection ring.
- (3) Inspect belt for track and slip-page.
- (4) Change chart at the same hour.
- (5) Check condition and operation of equipment in general.
- (6) Ventilate building as necessary.

Weekly

- (1) Clean fan house.
- (2) Open bearing drain plug, where required, to make sure bearings are taking oil.
- (3) Check supplies.

Six Months

- (1) Change oil in fan and motor bearings.
- (2) Check blades or spokes on fan.
- (3) Check tripping device for operation.
- (4) Check all mechanical and electrical bolted connections.
- (5) Check all relay and protective device settings.
- (6) Clean all relay and breaker auxiliary contacts.

Yearly

- (1) Clean all equipment and blow out with air.
- (2) Thorough inspection of belt.
- (3) Check oil in power transformers and oil breakers.
- (4) Paint floor and motor.
- (5) Make complete inventory of supplies and spare parts. Similar listings also are prepared for M-G set and rectifier servicing.

Maintenance Through Construction

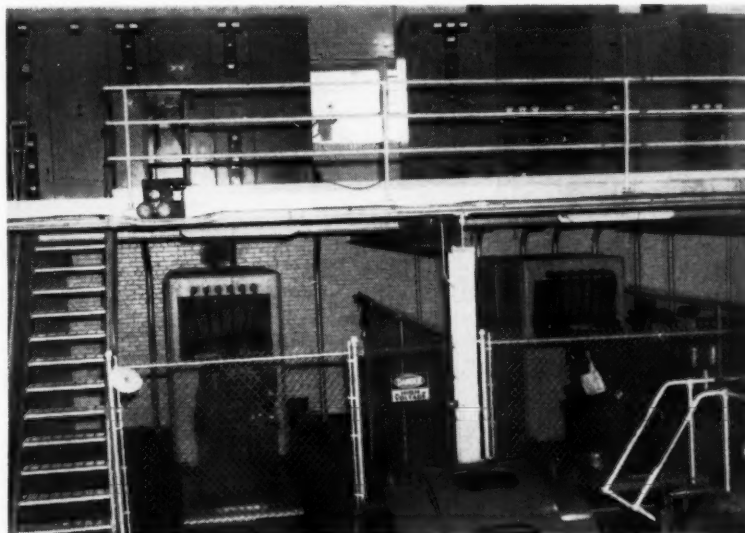
Under maintenance through construction and re-construction, we have designed our fan motor bases for adjustment in all directions, which permits much closer alignment, and subsequently, less bearing wear and more efficient operation.

The life of power cables entering the mine through bore holes has been greatly lengthened by mechanically tying the positive and negative feeders together with lineman's twine in order to limit the interaction between the two with surging currents and therefore eliminate the wear on the cable insulation where it is in intimate contact with the borehole casing.

Station type lightning arrestors and capacitors, together with improved grounding mats that are completely interconnected so as to improve the passage of surges to ground, have been a big aid in our program. Since 1949 we have lost two arrestors because of direct strokes with no other appreciable damage to



These two substations illustrate how the company has tried as much as possible to standardize equipment, substation design, and even the location of switches, equipment or spare parts within the station



the operating equipment, while in the two years just previous to their installation we suffered nine major outages with scores of later occurring malfunctions of equipment, or minor outages, because of light burning of flashing at the time of the original strike.

Need for a Planned System

With maintenance through planned system operation, we strive to locate our equipment for the best mine operating results by the most efficient utilization of the component units.

As the underground workings move forward, so do the air and power requirements. Therefore, with the exception of those needed to maintain

the haulage, the ventilating and conversion equipment can be moved forward in planned stages as the mine is developed.

In large mines this requires a close tie between the operating and maintenance departments for proper planning and coordination. Since no hard and fast rules can be stated for maintenance through planned system operation, it becomes necessary that the maintenance personnel keep informed by periodically checking load and voltage chart at substations and face entries, to determine when a unit can be freed for use elsewhere. The fact that many fans and conversion units are overloaded because of location rather than because of their coal producing loads, and that

greater production can be obtained at a reduced power bill coupled with less maintenance, emphasizes the need for a planned system.

Unexpected Breakdowns

As has been previously stated, unexpected breakdowns will occur with the best planned maintenance programs and large mines have this problem further aggravated by the simple reason of their size and the fact that the equipment is spread over a wide territory.

We, at Jones & Laughlin, having the benefit of a progressive-minded top-management, have been given the tools to handle all the jobs with which we are confronted in carrying out our maintenance program.

Besides a well equipped machine shop to support them, our outside crews are provided with the usual hand tools, a completely outfitted lineman's truck, a portable diesel-driven air compressor, together with a welding and burning truck.

When the first reports of a breakdown are called in, the maintenance foreman makes an immediate estimate of the extent of the damage, the manpower necessary to repair the known trouble; and what help can be expected from nearby units so that plans can be set for the mine's operation. All of the available equipment that may be needed together with any material not already on the site, is dispatched to the scene of the trouble.

As the repairs progress and new material or parts, not previously foreseen, are required, the general machine shop expeditiously takes care of these needs. We have found we are dollars ahead to invest money in all the proper tools and equipment necessary to do an efficient job, and, therefore, can hold out-of-service delays to a minimum, and at the same time restore the equipment to its original condition.

Conclusions

In summarizing we have endeavored to allocate specific duties to the individual, extensively train the repairman in the servicing of specific equipment, standardize our equipment and buildings, schedule comprehensive preventive maintenance and provide all the proper tools and repair materials.

Because the operation of the production machines is of paramount importance, we have tried to utilize all our equipment in the most advantageous way, with the least detriment to the machines, and with the main objective of supplying continuous service to the producing units.



Los Angeles

Host To Miners



Another record-breaking Convention and Exposition expected as industry gets set to turn out in force for 1956 Mining Show

LOS ANGELES, Calif., will welcome several thousand mining men and their ladies October 1 to October 4 as they gather for the 1956 Mining Show. For that week the city will truly be the mining capital of the world, with the industry turning out in force for the largest Metal Mining and Industrial Minerals Convention and Exposition ever held.

Most of the activity will take place in Los Angeles' Shrine Exposition Hall where 23 general and operating sessions and special conferences have been scheduled. Particular care has been taken to schedule these meetings to minimize any conflict of interest and to allow a maximum opportunity for everyone to examine and study the mammoth exhibition of machinery and supplies.

Something for All

The National Program Committee, under the guidance of Walter C. Lawson, Chairman, has done an outstanding job in preparing a well-rounded program that has something to offer for all those connected with the mining industry. Invitations to address the Convention have been accepted by some 150 outstanding speakers. Leading mining men, legislators and government administrators will exchange information and discuss the country's problems as they affect its basic industry.

Among those who will take part in the Convention proceedings are Senators Clinton P. Anderson of New Mexico, Wallace F. Bennett of Utah, Alan Bible of Nevada, Barry Goldwater of Arizona, and Thomas E. Martin of

Arrangement Committees

General Committee



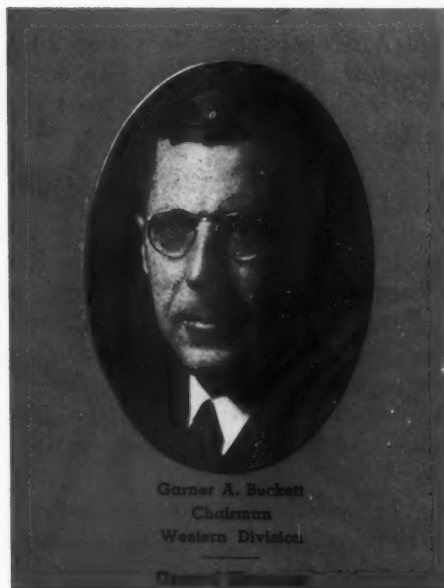
William C. Browning



Henry T. Mudd
Vice Chairman



Blair W. Stewart
Secretary



Garner A. Beckett
Chairman
Western Division

Publicity



Carl P. Miller
Chairman



Edward D. Arthur
Vice Chairman

Welcoming



Robert Mitchell
Chairman



George W. Nilsson
Vice Chairman

Trips



D. L. Marlett
Chairman



Ronald C. Griffin
Vice Chairman

Ladies Hospitality

Iowa; Congressmen William A. Dawson of Utah, Clair Engle of California and Cliff Young of Nevada.

Other State and Federal Government officials on the program include Governor Goodwin J. Knight of California; Elmer F. Bennett, Assistant to the Secretary of the Interior; Edward P. Cliff, Assistant Chief, U. S. Forest Service; Thomas G. Nolan, Director, U. S. Geological Survey, and Paul T. Allsman, Chief Mining Engineer, U. S. Bureau of Mines.

General sessions will be devoted to such divergent but pressing problems as national mineral policies, labor relations, taxes, monetary policy, public lands, developments in industrial minerals, the state of the metal mining

industries, strategic minerals, and the future of uranium. Operating sessions have been designed to cover the exploration, development, mining, and beneficiation of metal and nonmetallic minerals from A to Z.

Mrs. Harvey S. Mudd
Honorable Chairman

(Photo not available)



Mrs. Harold J. Clark
Chairman

On Pages 64 to 69 the full Convention program is presented. It will pay to study the program carefully and to plan one's time to obtain the maximum value from the various sessions.

Resolutions Will be Adopted

Even before Convention week starts, one group will be hard at work. The Resolutions Committee, headed by Kenneth C. Kellar of Lead, S. D., will be working on the Declaration of Policy. The "Declaration" spells out the position of the mining industry on matters of national import and serves as a guide for the American Mining Congress in matters of national policy.

The Resolutions Committee includes leaders in all branches of the mining industry from all sections of the country. They will carefully consider all suggestions offered them in drafting the proposed planks of the platform on which mining will take its stand during the coming year. At appropriate points during

the Convention sessions, the reports of the Resolutions Committee will be submitted to the Convention, affording an opportunity for careful consideration, and making it possible to give full publicity to the industry's position on public questions.

Exposition

At last count 160 manufacturers and suppliers of mining equipment were preparing to exhibit at the huge Mining Show. They will use 90,000 net square feet to exhibit their products and services and more than 2000 of their men will be on hand to answer questions and confer with mining men.

For comparison, the Show is 40 percent larger than that held in San Francisco two years ago. The Shrine Exposition Hall in Los Angeles will surely be the industry's "Main Street" on October 1, 2, 3 and 4.

Among other items the displays will include: the newest prospecting and surveying instruments; drills for prospecting, drills for blast

(Continued on page 69)

Board of Governors WESTERN DIVISION

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President, Riverside Cement Co.

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JOHN J. INMAN, Dist. Mgr., American Zinc, Lead & Smelting Co.
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CHARLES J. JOHNSTON, Treas., Goodnews Bay Mining Co.
J. C. KIEFFER, Gen. Mgr., Northwestern Mining Dept., American Smelting & Refining Co.
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E. H. LOVITT, Pres., Lovitt Mining Co.
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C. H. MURPHEY, Exec. Dir., New Mexico Mining Assn.
ROBERT S. PALMER, Exec. Vice-Pres., Colorado Mining Assn.
O. A. ROCKWELL, Vice-Pres., Eagle-Picher Co.
C. A. ROMANO, Resident Mgr., Intermountain Chemical Corp.
MILES P. ROMNEY, Mgr., Utah Mining Assn.
JOSEPH T. ROY, Mgr., East Helena Plant, American Smelting & Refining Co.
W. E. R. SMITH, Resident Mgr., American Zinc Co. of Illinois
CHESTER H. STEELE, Vice-Pres., Western Operations, The Anaconda Co.
CHARLES A. STEEN, Pres., Utah Exploration Co.
C. O. STEPHENS, Vice-Pres. & Gen. Mgr., Texas Gulf Sulphur Co.
E. C. STEPHENS, Geologist, Anaconda Co.
A. J. THOMPSON, Head, Dept. of Mining & Metallurgy, New Mexico Institute of Mining & Technology
L. E. TRAEGER, Supt., Conda Operation, Anaconda Co.
D. W. VILES, Vice-Pres., Western Div., Vanadium Corp. of America
CHARLES F. WILLIS, State Secy., Arizona Small Mine Operators Assn.
S. H. WILLISTON, Vice-Pres., Cordero Mining Co.
HUGH WRIGHT, Exec. Secy., Tri-State Zinc & Lead Ore Producers Assn.

Program Committee

State and District Chairmen



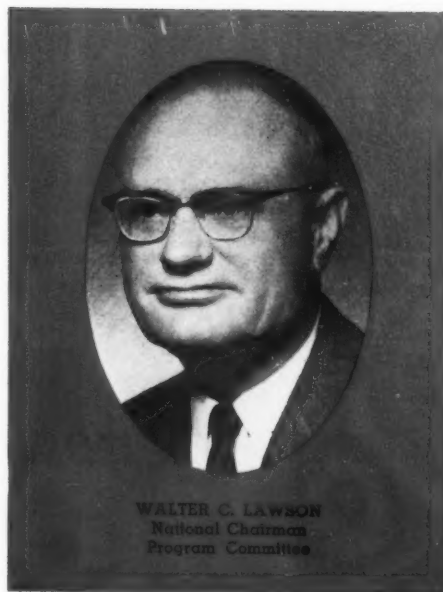
P. R. Bradley, Jr.
Alaska



L. T. Kett
California



R. R. Williams, Jr.
Colorado



WALTER C. LAWSON
National Chairman
Program Committee



James Boyd
Eastern States



John D. Bradley
Idaho



A. J. Cayla
Lake Superior



G. Donald Emigh
Mississippi Valley



Guy V. Woody
Manufacturers



Joseph T. Roy
Montana



Norman E. Hanson
Nevada



John B. Knaebel
New Mexico



E. S. Mollard
Oregon



D. H. McLaughlin
South Dakota



J. C. Archibald, Jr.
Texas



Clark L. Wilson
Utah



Drury A. Pifer
Washington



A. C. Harding
Wyoming



GOODWIN J. KNIGHT
Governor of
California



FRED A. SEATON
Secretary of the
Interior



CLINTON P. ANDERSON
Senator from
New Mexico



WALLACE F. BENNETT
Senator from
Utah



ALAN BIBLE
Senator from
Nevada



BARRY GOLDWATER
Senator from
Arizona

Convention Program

MONDAY, OCTOBER 1

9:40 A.M. PRE-SESSION MOTION PICTURE—"California and Its Natural Resources" (U. S. Bureau of Mines)

10:00 A.M. Opening Session

Presiding: GARNER A. BECKETT, Pres., Riverside Cement Co., Los Angeles; Chairman, Western Division, American Mining Congress

Welcome to California

HON. THOMAS A. KUCHEL, U. S. Senator from California

Responses

HOWARD I. YOUNG, Pres., American Zinc, Lead & Smelting Co., St. Louis; President, American Mining Congress

WALTER C. LAWSON, Gen. Mgr., Phelps Dodge Corp., Douglas, Ariz.; National Chairman, Program Committee

GUY V. WOODY, Gen. Representative, Sales, Allis-Chalmers Manufacturing Co., Milwaukee; Chairman, Manufacturers Division, A.M.C.

L. C. CAMPBELL, Vice-Pres., Eastern Gas & Fuel Associates, Pittsburgh; Chairman, Coal Division, A.M.C.

Introduction of distinguished guests

Presiding: HOWARD I. YOUNG, President, American Mining Congress

A Look at Our National Mineral Policies

HON. FRED A. SEATON, Secretary of the Interior.
HON. CLAIR ENGLE, U. S. Representative from California; Chairman, House Interior & Insular Affairs Committee

Resolutions Committee Reports:

General Policy
Government Reorganization
Solid Fuels

1:40 P.M. PRE-SESSION MOTION PICTURE—"Labor in Politics"

2:00 P.M. Labor Relations

Chairman: CLYDE E. WEED, Pres., The Anaconda Co.

Labor Relations and States' Rights

HON. BARRY GOLDWATER, U. S. Senator from Arizona

The Taft-Hartley Act—A Realistic Appraisal Today

HON. FRED A. HARTLEY, JR., National Right-to-Work Committee

Union Monopoly

LEO WOLMAN, National Bureau of Economic Research Inc.

Resolutions Committee Reports:

Labor Relations—Mine Safety—Social Security

1:40 P.M. PRE-SESSION MOTION PICTURE—"Los Angeles, City of Destiny" (Standard Oil Co. of California)

2:00 P.M. Milling and Metallurgy

Chairman: ROY A. HARDY, Consulting Engr., Getchell Mine, Inc.

Basic Economics—Wet vs. Dry Grinding

FRED C. BOND, Consulting Engr., Allis-Chalmers Manufacturing Co.

Experience with Cyclones at Chino

PAUL A. LEMKE, Metallurgical Engr., Chino Mines Div., Kennecott Copper Corp.

High Voltage and Magnetic Separation

J. HALL CARPENTER, Partner, Carpc Research & Engineering Co.

Emulsion Flotation

A. W. FAHRENWALD, Dean Emeritus, School of Mines, University of Idaho

5:15 P.M. Western Governors Mining Advisory Council

Address: HON. ROBERT E. SMYLIE, Governor of Idaho

Evening Open—No scheduled entertainment



THOMAS H. KUCHEL
Senator from
California



THOMAS E. MARTIN
Senator from
Iowa



THOMAS B. CURTIS
Congressman
from Missouri



WILLIAM A. DAWSON
Congressman
from Utah



CLAIR ENGLE
Congressman
from California



CLIFF YOUNG
Congressman
from Nevada

TUESDAY, OCTOBER 2

9:40 A.M. PRE-SESSION MOTION PICTURE—"Up From the Bed of a Desert Sea." Potash Operations at Carlsbad (Int'l. Min. and Chem. Corp.)

10:00 A.M. Developments in Industrial Minerals

Co-Chairmen:

D. L. MARLETT, *Vice-Pres.*, Great Lakes Carbon Corp.

WM. WALLACE MEIN, JR., *Pres.*, Calaveras Cement Co.

Significant Developments in Ceramic Raw Materials and Markets

RICHARD F. BROOKS, *Mgr. of Mining Operations*, Gladding, McBean & Co.

Diatomite in Calcium and Magnesium Silicates

HERBERT L. KING, JR., *Research Mgr.*, Celite Dept., Johns-Manville Corp.

What Makes a Gypsum Deposit Economic?

J. F. HAVARD, *Vice-Pres.*, Fibreboard Paper Products Corp.

Recent Developments in Limestones, Dolomites and Cement in California

OLIVER E. BOWEN, JR., *California Division of Mines*

Perlite and Other Lightweight Aggregates

PAUL W. LEPLA, *Technical Dir.*, Dicalite Div., Great Lakes Carbon Corp.

9:40 A.M. PRE-SESSION MOTION PICTURE—"Idaho and Its Natural Resources" (U. S. Bureau of Mines)

10:00 A.M. Exploration and Geology

Co-Chairmen:

JAMES BOYD, *Vice-Pres.*, Exploration, Kennecott Copper Corp.

IRA B. JORALEMON, *Consulting Engr.*, San Francisco

Successful Results of Exploration in Recent Years

IRA B. JORALEMON, *Consulting Engr.*, San Francisco

Symposium on Ore Discoveries and Methods of Exploration

D. R. LOCHHEAD, *Falconbridge Nickel Mines, Ltd.*

BLAIR W. STEWART, *Vice-Pres.*, Copper and Zinc Co.



ELMER F. BENNETT
Assistant to the
Secretary of Interior



WESLEY A. D'EWART
Assistant to the
Secretary of
Agriculture



THOMAS G. NOLAN
Director, U. S.
Geological Survey



EDWARD P. CLIFF
Assistant Chief
U. S. Forest Service



FRED. A. HARTLEY, JR.



DR. LEO WOLMAN

THOMAS G. NOLAN, *Director*, U. S. Geological Survey

PAUL T. ALLSMAN, *Chief Mining Engr.*, U. S. Bureau of Mines

Resolutions Committee Report:
Mine Financing

9:40 A.M. PRE-SESSION MOTION PICTURE—"Nuclear Reactors for Research" (Atomic Energy Commission)

10:00 A.M. Uranium Milling

Chairman: MARVIN L. KAY, *Vice-Pres. & Gen. Mgr.*, Climax Uranium Co.

Metallurgy of Uranium Ores

D. C. SEIDEL, *Chief Metallurgist*, Union Carbide Nuclear Co.

Milling Operations at Anaconda's Bluewater Plant

E. C. PETERSON, *Asst. Mgr.*, and D. C. MATTHEWS, *Chief Metallurgist*, The Anaconda Co.
(Continued next page)

PROGRAM

(Tuesday, October 2, Continued)

Research and New Developments in Uranium Processing
C. K. MCARTHUR, *Mgr. of National Lead Co.*
A.E.C. Pilot Plant, Grand Junction, Colo.
E. H. CRABTREE, *Director, Colorado School of Mines Research Foundation, Inc.*

Plant Application of Solvent Extraction in Uranium Milling
WOODROW KNOTT, *Plant Mgr., Climax Uranium Co.*

1:40 P.M.—PRE-SESSION MOTION PICTURE—"A New Look at the H-Bomb" (Atomic Energy Commission)

2:00 P.M. Tax Panel

Chairman: HON. THOS. E. MARTIN, *U. S. Senator from Iowa*

HON. CLINTON P. ANDERSON, *U. S. Senator from New Mexico*

HON. THOMAS B. CURTIS, *U. S. Representative from Missouri*

HENRY B. FERNALD, *Loomis, Sufferin & Fernald; Chairman, Tax Committee, A.M.C.*

ELLSWORTH C. ALVORD, *Alvord & Alvord; Tax Counsel, A.M.C.*

Resolutions Committee Report:

Taxation and Government Expenditures

Gold, Silver and Monetary Policy

Co-Chairmen:

DONALD H. McLAUGHLIN, *Pres., Homestake Mining Co., San Francisco; Chairman, Gold Producers Committee, A.M.C.*

ROBERT M. HARDY, JR., *Pres., Sunshine Mining Co.*

Our Gold Policy

B. F. PITMAN, JR., *Pres., Pitman & Co., Investment Bankers*

The Silver Situation

HON. WALLACE F. BENNETT, *U. S. Senator from Utah*

Future Prospects for Silver

ELGIN GROSECLOSE, *Economic Counsel, Washington, D. C.*

Resolutions Committee Report:

Gold, Silver and Monetary Policy

1:40 P.M. PRE-SESSION MOTION PICTURE—"Man With a Thousand Hands." Alcan's Kitimat Project

2:00 P.M. Drilling Symposium

Chairman: O. A. ROCKWELL, *Vice-Pres., Eagle-Picher Co.*

Standardization of Measurements

RAYMOND STEWART, *Asst. Planning Engr., Climax Molybdenum Co.*

Discussion:

L. F. BISHOP, *Research Engr., The Anaconda Co.*

S. S. CLARKE, *Consulting Engr., Baxter Springs, Kans.*

Maintenance of Rock Drills, Bits and Drill Steel

C. N. KRAVIG, *Mine Supt., and WILLIAM C. CAMPBELL, Asst. Mine Supt., Homestake Mining Co.*

Discussion:

T. E. GIGGEY, *Sales Repr., Ingersoll-Rand Co.*
GEORGE HAZEN, *Plant Supt., Brunner & Lay Co.*

N. L. McCOMBS, *Applications Engr., Rock Drill Div., Joy Manufacturing Co.*

1:40 P.M. PRE-SESSION MOTION PICTURE—"Iron Ore Unlimited"—The Story of Minnesota's Iron Country

2:00 P.M. Open Pit Mining

Chairman: A. D. CHISHOLM, *Managing Partner, Pickands Mather & Co.*

Rotary Drilling for Open Pit Blast Holes

R. W. WHITNEY, *Mgr. of Mines, M. A. Hanna Co.*

Drilling at Eagle Mountain

MARTIN J. HUGHES, *Mgr., Eagle Mountain Mine, Kaiser Steel Corp.*

Transportation From Open Pits Belts and Belt Conveyors

LLOYD S. CAMPBELL, *Asst. Gen. Supt., Eastern Dist., Oliver Iron Mining Div., U. S. Steel Corp.*

Application of Various Types of Trucks for Open Pit Haulage

C. V. ISBELL, *Pres., Isbell Construction Co.*

Rail Haulage at Morenci

WARREN E. FENZL, *Gen. Supt., and LAWRENCE ORMSBY, Mine Supt., Phelps Dodge Corp.*

Skip Haulage

RICHARD P. CARDEW, *Engr., National Iron Co.*

6:30 P.M. Miners Jamboree Hollywood Palladium

WEDNESDAY, OCTOBER 3

9:40 A.M. PRE-SESSION MOTION PICTURE—"How a Bill Becomes Law"

10:00 A.M. Public Land Problems

Chairman: HON. WILLIAM A. DAWSON, *U. S. Representative from Utah*

Administration of Public Laws 167 and 585—The "Multiple Use" Acts

HON. WESLEY A. D'EWART, *Special Assistant to the Secretary of Agriculture*

EDWARD P. CLIFF, *Assistant Chief, U. S. Forest Service*

Curbing Military Land Withdrawals

HON. CLIFF YOUNG, *U. S. Representative from Nevada*

Legal Needs to Permit Broader Use of New Exploration Techniques

Moderator: ELMER F. BENNETT, *Assistant to the Secretary of the Interior*

Panel Members:

C. JAY PARKINSON, *The Anaconda Co.*

CLAIR M. SENIOR, *Senior & Senior*

ROBERT S. PALMER, *Exec. Vice-Pres., Colorado Mining Association*

(Continued next page)

ROGER H. McCONNEL, *Chief Geol.*, The Bunker Hill Co.

RICHARD N. HUNT, *Vice-Pres.*, U. S. Smelting Refining & Mining Co.

Resolutions Committee Reports:

Public Land Policy
Water and Air Pollution

9:40 A.M. PRE-SESSION MOTION PICTURE—"Mining for Nickel" (Int'l. Nickel Co.)

10:00 A.M. Underground Mining

Chairman: JOHN D. BRADLEY, *Pres.*, Bunker Hill Co.

Support of Heavy Ground in Bulk Mining Operations
R. W. EDWARDS, *Supt.*, Inland Steel Co.

Discussion:

J. W. STILL, *Consulting Engr.*

Underground Uranium Mining Methods

DONALD T. DELICATE, *Supt. of Mines*, and GORDON M. MINER, *Asst. Supt. of Mines*, Utah Div., Homestake Mining Co.

Underground Transportation Symposium

Rail Haulage

CHARLES A. CLEEVES, *Asst. Mine Supt.*, Climax Molybdenum Co.

Conveyors

J. E. TONG, *Asst. Mgr. & Mine Supt.*, Duval Sulphur & Potash Co.

Auto Trucks Underground

GILL MONTGOMERY, *Vice-Pres. & Gen Mgr.*, Fluorspar Div., Minerva Oil Co.

9:40 A.M. PRE-SESSION MOTION PICTURE—"Zinc Controls Corrosion" (American Zinc Institute)

10:00 A.M. Milling and Metallurgy

Chairman: F. A. MCGONIGLE, *Vice-Pres.*, Haile Mines, Inc.

New Conveying and Electronic Weighing System

MELVIN A. STOKKE, *Supt. of Crushing and Conveyor Plant*, Anaconda Reduction Works.

Taconite Beneficiation

ROBERT J. LINNEY, *Vice-Pres. in Chg. Operations*, Reserve Mining Co.

Practical Aspects of Pressure Leaching and Precipitation Processes

FRANK A. FORWARD, *Head, Dept. of Mining & Metallurgy*, University of British Columbia

Applications of Solvent Extraction in the Metallurgical Industry

R. S. OLSON, *Metallurgist*, Mining Technical Service, Dow Chemical Co.

1:40 P.M. PRE-SESSION MOTION PICTURE—"The World That Nature Forgot" (Monsanto Chemical Co.)

2:00 P.M. Management Problems

Chairman: CLARK L. WILSON, *Vice-Pres.*, New Park Mining Co.

Mining's Shortage of Engineering and Scientific Manpower—What to do about it?

MORROUGH P. O'BRIEN, *Chairman*, Dept. of Engineering, University of California

Non-Productive Wage Costs and Their Significance
L. J. RANDALL, *Pres.*, Hecla Mining Co.

Education of Employees in the Economic Principles of Mining
HOWARD B. GUNDERSEN, *Asst. Dir. of Industrial Relations*, Kennecott Copper Corp.

Incentive Plans in the Mining Industry—A Panel Discussion
JOHN EDGAR, *Mgr.*, Mining Div., Sunshine Mining Co.

THEODORE BARRY, *Pres.*, Theodore Barry & Associates

MORLEY H. MATTHEWSON, *Mgr.*, Industrial Engineering Dept., International Minerals & Chemical Corp.

1:40 P.M. PRE-SESSION MOTION PICTURE—"The Modern Way to Weed Control" (Pacific Coast Borax Co.)

2:00 P.M. Industrial Minerals—Production and Processing

Co-Chairmen:

WM. WALLACE MEIN, JR., *Pres.*, Calaveras Cement Co.

D. L. MARLETT, *Vice-Pres.*, Great Lakes Carbon Corp.

Heat Processing of Pelletized Materials as Developed for the Cement Industry

B. H. PUERNER, *Asst. Mgr.*, Processing Machinery Dept., Allis-Chalmers Manufacturing Co.

Production of Specification Gravels for Concrete by Heavy Media Separation

F. E. LEGG, JR., *Asst. Prof.*, Engineering Materials, University of Michigan

Recent Developments in Mining and Transportation of Gilsonite

JOHN H. BAKER, *Asst. to Mgr. of Production*, American Gilsonite Co.

Union Oil's Shale Demonstration Plant—Mining and Retorting Methods

FRED L. HARTLEY and G. H. HEMMEN, *Research Dept.*, Union Oil Co. of Calif.

New Underground Mining Development at Crestmore
R. H. WIGHTMAN, *Mine Mgr.*, Riverside Cement Co.

1:40 P.M. PRE-SESSION MOTION PICTURE—"Uranium—The Development of a New Industry" (U. S. Bureau of Mines)

2:00 P.M. Uranium Exploration and Mining

Chairman: T. O. EVANS, *Chief Mining Engr.*, Atchison, Topeka & Santa Fe Railway Co.

Uranium Developments in the West

A. E. JONES, *Mgr.*, Grand Junction Operations Office, U. S. Atomic Energy Commission

Geology of the Uranium Deposits at Ambrosia Lake, N. Mex.

ROBERT G. YOUNG, *Geol.*, Grand Junction Operations Office, U. S. Atomic Energy Commission

Open Pit Operations at the Jackpile Mine

ALBERT FITCH, *Mgr.*, and JOHN HERNDON, *Mine Supt.*, The Anaconda Co.

The Gunnar Uranium Deposit—From Discovery to Production in 38 Months

J. N. BOTSFORD, *Mine Mgr.*, Gunnar Mines Limited.

What the Years After 1962 Hold for the Independent Uranium Prospector and Miner

G. R. "BUFFALO" KENNEDY, *Rio de Oro Uranium Mines, Inc.*

Evening Open—no scheduled entertainment
(Continued next page)

PROGRAM *(Continued)*

THURSDAY, OCTOBER 4

9:40 A.M. PRE-SESSION MOTION PICTURE—"Arizona and Its Natural Resources" (U. S. Bureau of Mines)

10:00 A.M. State of the Metal Mining Industries

Chairman: WALTER C. LAWSON, *Gen. Mgr.*, Phelps Dodge Corp.

Nonferrous Metals

SIMON D. STRAUSS, *Vice-Pres.*, American Smelting & Refining Co.

Iron Ore

WALTER A. STERLING, *Pres.*, Cleveland-Cliffs Iron Co.

Light Metals

LAWRENCE LITCHFIELD, JR., *Vice-Pres.*, Mining Div., Aluminum Corp. of America

Strategic Metals

S. H. WILLISTON, *Vice-Pres.*, Cordero Mining Co.; Chairman, Strategic Minerals Committee, A.M.C.

Uranium

MERRITT K. RUDDOCK, Almar Exploration Co.

Special Metals and Rare Earths

EUGENE B. HOTCHKISS, *Vice-Pres.*, Vitro Corp. of America

Resolutions Committee Report:

Tariff, Stockpiling and Mineral Programs

9:40 A.M. PRE-SESSION MOTION PICTURE—Kiruna Iron Mining Operations, Northern Sweden

10:00 A.M. Open Pit Mining

Chairman: C. D. MICHAELSON, *Gen. Mgr.*, Western Mining Divisions, Kennecott Copper Corp.

Mining Operations of the Reynolds Metals Co.

WALTER L. RICE, *Pres.*, Reynolds Mining Corp.

Development Planning of Open Pit Mining in the Butte District

E. P. SHEA, *In Charge of Butte Geological Dept.*, The Anaconda Co.

New Developments in Borax Mining at Boron

WILLIS H. WAMSLEY, *Mine Supt.*, Pacific Coast Borax Div., U. S. Borax & Chemical Corp.

Silver Bell Pit Operation

D. R. PURVIS, *Supt.*, Silver Bell Unit, American Smelting & Refining Co.

9:40 A.M.—PRE-SESSION MOTION PICTURE—"Make Mine Safety"—The Story of Roof Bolting (Colorado Fuel & Iron Corp.)

10:00 A.M. Health and Safety Conference

Chairman: R. R. WILLIAMS, JR., *Mgr.*, Mining Dept., Colorado Fuel & Iron Corp.

Organizing for Safety

LEONARD R. FLICKER, *Senior Safety Engr.*, Permanente Cement Co.

Safety Incentives

E. C. LEONARD, *Safety Dir.*, Inland Steel Co.

Industrial Hygiene Dust Elimination Methods and Equipment

JOHN W. WARREN, *Chief Ventilation & Industrial Hygiene Engr.*, The Anaconda Co.

Silicosis Research

HENRY N. DOYLE, *Asst. Chief*, Occupational Health Program, U. S. Public Health Service, and ROBERT H. FLINN, *Chief*, Division of Health, U. S. Bureau of Mines

12:15 P.M. Luncheon Meeting—Board of Governors, Western Division, American Mining Congress

Venetian Room, Ambassador Hotel

1:40 P.M. PRE-SESSION MOTION PICTURE — "Developing Homogeneous Reactors" (Atomic Energy Commission)

2:00 P.M. Uranium in the Future

Chairman: P. L. MERRITT, *Senior Geol.*, E. J. Longyear Co.

Observations on Uranium and Nuclear Energy

HON. CLINTON P. ANDERSON, *U. S. Senator from New Mexico*

Canada's Uranium Program

RICHARD E. BARRETT, *Vice-Pres.*, Eldorado Mining & Refining Co.

The Future of Uranium in the Atomic Industry

CHAUNCEY STARR, *Vice-Pres.*, North American Aviation Inc.; *Gen. Mgr.*, Atomic International Div.

A Petroleum Company Looks at Uranium

GERHARD HERZOG, *Director of Research*, The Texas Co.

Report of Resolutions Committee:
Uranium

1:40 P.M. PRE-SESSION MOTION PICTURE—Use of High Capacity Wheel Excavators in Germany

2:00 P.M. Underground Mining

Chairman: A. S. KROMER, *Vice-Pres. & Gen. Mgr.*, Calumet Div., Calumet & Hecla, Inc.

Mechanization at Indian Creek Mine of St. Joseph Lead Co.

ELMER A. JONES, *Div. Mgr.*, St. Joseph Lead Co.

Shaft Sinking in Uranium Mining on the Plateau

WM. H. LOVE, *Mgr. of Mines*, Hecla Mining Co., and PHILIP LINDSTROM, *Supt. of Utah Operations*

The Koepe Friction Hoist

R. G. SCHAAL, *Chief Mech. Engr.*, Cleveland-Cliffs Iron Co.

Inclined and Vertical Shaft Sinking with the Cryderman Mucker

J. C. O'DONNELL, *Development Engr.*, Shaft & Development Machines Co.

Planing Phosphate Rock in Montana

F. E. BURNET, *Supt.*, Montana Phosphate Products Co. and

T. E. HOWARD, U. S. Bureau of Mines, Spokane
(Continued next page)

2:00 P.M. Strategic Minerals Conference

Presiding: S. H. WILLISTON, *Vice-Pres., Cordero Mining Co.; Chairman, Strategic Minerals Committee, A.M.C.*

Addresses:

HON. ALAN BIBLE, *U. S. Senator from Nevada*
HON. WILLIAM A. DAWSON, *U. S. Representative from Utah*

Panel Discussion

7:00 P.M. Annual Banquet

**Embassy Room and Coconut Grove,
Ambassador Hotel**

Toastmaster: HON. GOODWIN J. KNIGHT, *Governor of California*

Introduction of Distinguished Guests

Special Entertainment

FRIDAY, OCTOBER 5

9:30 A.M. Tax Conference (Open to tax to accountants and attorneys 5:00 P.M. and interested mining men)

Chairman: HENRY B. FERNALD, *Chairman, Tax Committee, American Mining Congress*

Discussion of pertinent features of Internal Revenue Code and the regulations thereunder, together with proposals for appropriate amendments to the Revenue Laws

(Continued from page 62)

holes; drilling and blasting supplies; scrapers and mechanical loaders for use underground; power shovels, drag lines and other loading equipment for open pit mines; mine cars, conveyors, trucks and self-unloading vehicles for both surface and underground haulage; locomotives, tractors and engines; screens, crushers, rod and ball mills; gravity separation machinery and flotation equipment; classifiers; and all the thousand and one items of auxiliary equipment, safety devices and operating supplies that help make domestic mining the most efficient and safest minerals industry on earth.

Men in attendance at the various exhibits are there to help. Many of them are technical men and all of them appreciate the problems faced in the day-to-day working of mining properties. Some are world-renowned specialists in their fields and will be able to offer much good advice. Every one of them will be happy to take as much time as necessary to discuss the applications of the new equipment on display or to make suggestions for the most

efficient use of existing equipment under particular conditions. Be sure to take advantage of this opportunity to investigate the different ways of performing the work that is your responsibility.

The combination of Convention sessions and Exposition makes the 1956 Mining Show an outstanding educational opportunity. Nowhere else is it possible to meet so many industry leaders, learn so much about latest operating procedures, and see the largest display of metal and nonmetallic mining equipment in the world at the same time. Those that attend and take advantage of the opportunities will come away with a broader knowledge of their industry, and a renewed enthusiasm which will more than pay off in new ideas and greater efficiency throughout the year.

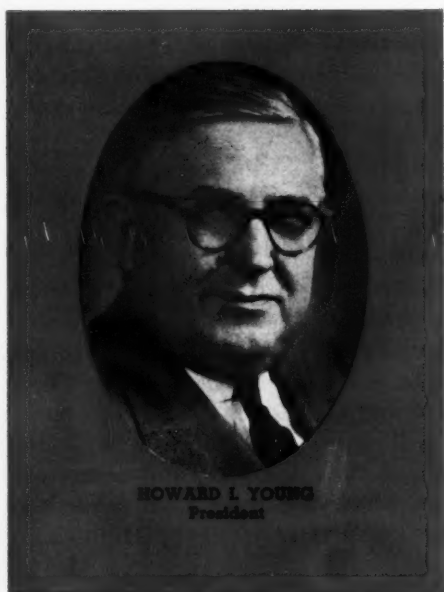
Entertainment for All

Los Angeles and entertainment are synonymous. The American Mining Congress has laid careful plans to make the hours not taken up by the Convention itself a time to be remembered by all.

Tuesday and Thursday evenings will be devoted to AMC functions; Monday and Wednesday evenings have been left open so that Convention-goers can attend any of the numerous private parties being arranged or visit with friends, old and new.

On Tuesday, October 2, the Miners Jamboree will feature a dinner-dance at the beautiful Hollywood Palladium on Sunset Boulevard. Known throughout the entertainment world, the Palladium offers a glamorous setting for the Jamboree, with plenty of room for dining and dancing. Fine food, a name band, an excellent dance floor, and a top notch entertainment program will make this a big evening. Featured in the entertainment program will be Dorothy Shay, the "Fifth Avenue Hillbilly" of "Feudin', Fussin' and a-Fightin'" fame.

The social climax to the Convention will be the traditional Annual Banquet on Thursday evening. The 1956 version will feature Marguerite Piazza, Metropolitan Opera soprano and well-known radio and TV star; Johnny O'Brien, the "It's Possible!" comedian, whose droll comments and harmonica-playing have



HOWARD L. YOUNG
President



Directors *American Mining Congress*



HORACE M. ALBRIGHT



JOEL M. BOWLBY



WORTHEN BRADLEY



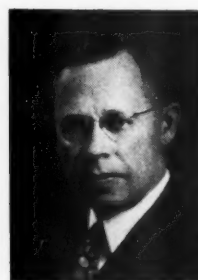
LOUIS S. CATES



CHARLES R. COX



ROBERT E. DWYER



RUDOLPH E. ELSTAD



ANDREW FLETCHER



EDWARD G. FOX



G. B. HARRINGTON



HERBERT C. JACKSON



L. RUSSELL KELCE



GEORGE H. LOVE

brought down many a house; and the popular Freddy Martin and his orchestra. The "speechless" banquet will be held in the world-famous Embassy Room and Cocoanut Grove of the Ambassador Hotel.

Ladies Have Special Program

As always, the ladies have been extended a specific invitation to come to Los Angeles. In addition to the Exposition, Convention sessions and evening functions, they are particularly

invited to take part in the fine program of day-time events arranged just for them.

A Welcoming Luncheon will be held Monday to get the week off to a good start. This delightful affair will be in the Biltmore Bowl and will feature the Hilo Hattie Troupe with the captivating songs and dances of Hawaii.

Guide-books and maps will be the order of the day Tuesday as the women are taken on a sightseeing tour of the Los Angeles area, in-

ton Hotel. Several leading California designers will present selections from their "Fall-Winter" and "Resort-Cruise" collections.

Trips

Of interest to both men and women will be the AMC trip to Disneyland on Friday, October 5. We're all kids at heart and many will certainly want to take this opportunity to visit "The Magic Kingdom." This famous park is something of a fair, a city from the



D. S. MacBRIDE



F. S. MULOCK



J. W. OVERSTREET

amc **Directors** (Continued)



CHARLES J. POTTER



L. J. RANDALL



R. E. SALVATI



MERRILL E. SHOUP



HARRIE S. TAYLOR



WALTER A. WECKER



J. E. M. WILSON



GUY V. WOODY

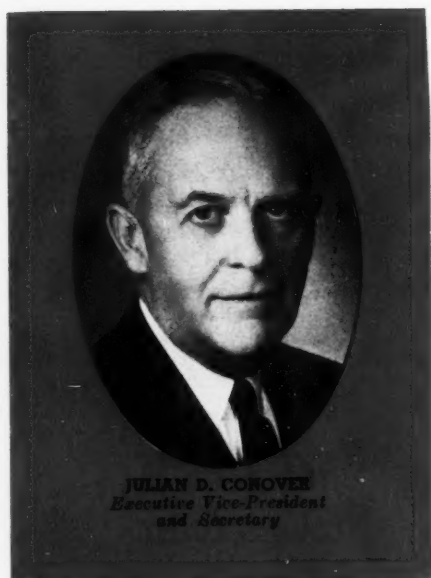
...

cluding Hollywood, homes of the movie stars in Beverly Hills and Bel Air, Will Rogers State Park, and the beach at Santa Monica.

A luncheon and fashion show will be held on Wednesday at the sumptuous Beverly-Hil-

Arabian Nights, and a metropolis of the future all in one. Transportation has been arranged from three hotels to the park and return.

Three varied and interesting field trips have also been arranged for October 5. One group



JULIAN D. CONOVER
*Executive Vice-President
and Secretary*

a M C Staff Members



HARRY L. MOFFETT



JOHN R. ARANT



HENRY I. DWORSHAK

Public Relations

will inspect the underground limestone mining and cement production facilities of the Riverside Cement Company at Crestmore; see the Kaiser Steel plant at Fontana, including stops at the blast furnace, open hearth, and continuous weld pipe mill; and visit the Irwindale Plant of Consolidated Rock Products Company at Azusa. Mining ladies, while their men-folk are visiting the Riverside Cement Company, will proceed to Riverside, Calif., for a tour of the internationally famous Mission Inn.

Another group will tour the southern area of Los Angeles, including the famous oil wells of Wilmington and Long Beach, followed by a visit to the huge Watson Refinery of the Richfield Oil Company. After a luncheon at the Portuguese Bend Club a tour will be made of the rolling hills of the Palos Verdes Peninsula, with a visit to Marineland of the Pacific and stops at Wayfarers' Chapel, San Pedro Hill and the model community of Palos Verdes Estates. A visit to the diatomite plant



P. D. McMURRER
Assistant Secretary



WILLIAM I. POWELL
Taxation



G. B. SOUTHWARD
Mechanization Engineer



ROBT. W. VAN EVERA
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GEORGE W. SALL
Managing Editor



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Assistant Editor

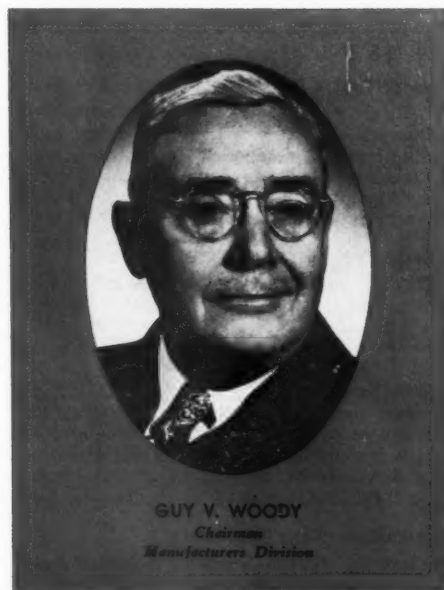
Mining Congress Journal

and laboratories of Great Lakes Carbon Corp. will complete the tour.

Still another party will journey for a visit to the Boron operations of the Pacific Coast Borax Division of United States Borax and Chemical Corp. This group will inspect the

(Continued on page 81)

The Exposition



ONE HUNDRED SIXTY manufacturers and suppliers of mining equipment will use 90,000 net square ft to display their products and services in Los Angeles' Shrine Exposition Hall. Read the following exhibit descriptions closely and make note of those you particularly want to see. This preview is your key to maximum dividends from the greatest mining show on earth.

- **AERO-COUPLING CORP.**

Will show its full line of bulk hose and reusable fittings.

- **AEROPRODUCTS OPERATIONS,
ALLISON DIVISION, GENERAL MOTORS CORP.**

Featured will be the Aeroproducts Hydrostarter which was designed to provide positive quick starts for diesel engines under widely varying temperatures. The starting system consists of a hydraulic motor, a piston type accumulator, an engine driven pump, a reservoir, and a manual pump. No outside source of energy is required.

- **AERO SERVICE CORP.**

Exhibit will feature the latest techniques and applications of photogrammetry and airborne electronic survey to the mining industry. This includes aerial photography, photo mosaics, topographic maps, and the airborne magnetometer and the airborne scintillation counter.

- **ALBANY FELT CO.**

Plans to show its complete line of fume and dust bags made from natural and adaptable synthetic fibers. Wet filter cloths for plate and frame presses, disc filters, and rotary vacuum filters will also be included. Pertinent information on all fiber characteristics will be available.

- **ALLEGHENY LUDLUM STEEL CORP.**

Will have a complete display of coal mining bits, rock drill bit blanks, rotary blanks, core bit blanks and auger bit blanks.

- **ALLEN-SHERMAN-HOFF PUMP CO., THE**

Plans to feature its Centriseal pump which is designed for pumping abrasive and/or corrosive fluid-solid mixtures. The pump requires no gland seal water and is lined for longer life with replaceable parts of rubber or synthetic substitutes.

- **ALLIS-CHALMERS MANUFACTURING CO.**

Features of the Allis-Chalmers exhibit will be a scale model of an ACL traveling gate process cement plant, a scale model of a Hydrocone crusher, pumps, motors, starters and Texrope V-belt drive equipment. In addition, a complete line of construction machinery, including large crawler tractors and motor scrapers, and diesel engines and motor-generator sets will be shown.

- **ALLOY STEEL AND METALS CO.**

Will show their largest and smallest Pacific Scrapers—the Model 2D-84 in. and Model 2A-26 in. In addition, other Pacific mining equipment including full plate, half

plate, wide throat and utility sheave blocks as well as the Round-the-Corner sheave block, and Pacific sheave anchors will be shown.

• **AMERICAN AIR FILTER CO., INC.**

Will show two dust control units—the Type N and the “Amerjet”—together with a mechanical book presentation of the company's complete line of dust control products. Both units (the Type N is a hydro-static precipitator and the “Amerjet” is a high efficiency, dry-type fabric dust arrester) will be in operation.

• **AMERICAN CHAIN & CABLE CO., INC.**

Display will feature long lengths of VHS drag lines, shovel hoist lines, and slusher ropes for heavy-duty service.

• **AMERICAN MANGANESE STEEL DIVISION OF AMERICAN BRAKE SHOE CO.**

Will have on display the AMSCO MF semi-automatic welding machine with solid and tubular hardfacing and manganese wires. Also shown will be a renewable-lip dipper, a new design for ball and rod mill liners, new two-part dipper teeth, as well as other manganese steel and alloy steel castings used in the mining industry.

• **AMERICAN STEEL FOUNDRIES**

Plans to display its new Wearpact cast alloy steel, designed to withstand impact and abrasive wear. Wearpact dipper teeth, track shoes and grousers, and the available types of Wearpact teeth will also be shown.

• **ANACONDA WIRE & CABLE CO.**

Emphasis in this exhibit will be on Anaconda shuttle car cables. Additional cables to be featured are shovel cable, mining machine cable, Type G cable and mine power cable.

• **ATLAS COPCO PACIFIC INC.**

First U. S. showing of the new Atlas Copco BBC-22 rock drill which incorporates a retractable “stinger” in its integral pusher leg will be made here. Also shown will be the new 53-lb self-contained Cobra drill and an Atlas Copco CT-4 compressor powered by a four-cylinder air-cooled Duetz diesel engine.

• **ATLAS POWDER CO.**

Will feature new motion pictures showing confined blasting action along with stereo slides showing sequence details of such blasting. Dummy samples of the wide range of Atlas blasting agents and high explosives will also be exhibited including Amocore, the new blasting agent with a gelatin core. In blasting supplies, Atlas will show its Twinplex electric blasting assembly and improved Shotmaster blasting machine.

• **AUSTIN-WESTERN CO.**

Will show its new hydraulic crane—which combines the features of crawler, truck and industrial shop cranes—and the Super 99 6-wheel drive and 6-wheel steer power grader.

• **BALDWIN-LIMA-HAMILTON CORP. EQUIPMENT CONSTRUCTION DIVISION**

Will feature its line of mining equipment.

• **BAND-IT CO., INC.**

Will feature the use of Band-It clamps on pressure clamping jobs for hose, pipes, tanks and emergency repairs.

• **BARBER-GREENE CO.**

Display will feature the advantages of standardized conveyors and the Duo-Screen, a German development

soon to be produced for the American market by Barber-Greene. The new screen is designed for high-capacity screening of wet, sticky, and other difficult materials that now require heated screens.

• **BETHLEHEM PACIFIC COAST STEEL CORP.**

Booth will demonstrate the advantages of steel yieldable arches in supporting heavy ground. Other steel products for mining which will be featured include roof bolts, wire rope, and drill steel.

• **BICO INC.**

A new sonic-sound actuated heavy media concentrator employing the theory of pulsed hindered setting will be demonstrated. In addition, a complete line of Bico-Braun laboratory equipment including crushers, pulverizers, and grinders will be shown in operation. Bico assay furnaces, shakers, calmix cupels, and the new ceramic pulverizer will also be exhibited.

• **BIXBY-ZIMMER ENGINEERING CO.**

Will show a unique slot screen in operation to illustrate its dewatering application. Featured will be the new Iso Rod screen and all types of Bixby-Zimmer screen surfaces.

• **BOSTON WOVEN HOSE & RUBBER CO.**

Boston will introduce a new line of high tension conveyor belts. Other products to be shown will include the complete line of Boston conveyor, elevator, transmission, and V-belts, air, water, face, rock-dust, steam, suction and welding hose.

• **BOYLES BROS. DRILLING CO., LTD.**

Will show three surface and three underground diamond drills and will have on display a sample exhibit of diamond set bits and reamer shells. Featured will be their new Model BBS-3 rotary/core surface drill with self-centering hydraulic chuck and cat-head. Also shown will be a Model X-Ray prospector's core drill, flight drainers, Pionjar rock drills and S K F drill steel.

• **BRODERICK & BASCOM ROPE CO.**

Will feature its new Powersteel wire rope and Yellow Strand, flattened strand wire rope. Both are heavy duty ropes intended where service conditions are severe and rope of high quality is required.

• **BROWN, INC., DAVID**

Will use a transparent working model to features of Radicon speed reducers. In addition, all types of single reduction Radicons will be shown, some being introduced for the first time.

• **BRUNNER & LAY ROCK BIT CORP.**

Display will include a complete line of tungsten carbide drill bits and integral drill steels. It will include Rok bits, X Design Rok bits, Chisel Style Rok bits, and couplings, bit adapters, intraset drill steels and samples of various threads furnished.

• **BUCYRUS-ERIE CO.**

A working model of Bucyrus-Erie's 6-cu yd 150-B electric shovel will be featured. Scaled down to 1/12 size, it actually performs all shovel functions—hoist, swing, crowd, retract, and propel. The model will be in operation, using an actual operator's station from a full size machine.

• **BULLARD CO., E. D.**

Will exhibit glass fibre, aluminum and estherene safety hats and caps, unit type first aid kits and first aid supplies, Bullard's aerosol burn spray, safety hoist hooks, eye and face protection, safety clothing, safety back-up

alarms for trucks, and a complete line of industrial and mining safety equipment.

• **C & D BATTERIES, INC.**

Highlighting this exhibit will be two higher-capacity motive power batteries, featuring C & D's new 66 and 125 ampere-hr cells. Also on display will be enlarged models showing C & D's Slyver-Clad five-fold plate construction and cell design.

• **CARD IRON WORKS CO., THE C. S.**

Exhibit will be of operating scale models of mine ore cars and automatic ore skips so arranged that material will be handled completely automatic.

• **CARDOX CORP.**

A new general purpose drill, mountable on a flat-bed truck, crawler, farm-type tractor or other vehicle equipment, will be featured. Designed to simplify many jobs, the drill can be used in any fore-and-aft or lateral direction at any angle from horizontal to vertical.

• **CARPCO MANUFACTURING INC.**

Will have a mobile laboratory on exhibition to demonstrate progressive metallurgical technology using modern methods of specific gravity, high tension, and magnetic separation. Equipment in the laboratory includes a fan concentrator, a wet shaking table, high tension separators, induced roll magnet and permanent magnet, sample splitters, scale models of bucket elevators, belt conveyors, and shaking conveyors.

• **CATERPILLAR TRACTOR CO.**

Featured will be a D9 tractor with tilt-dozer and hydraulic ripper. Another attraction will be a No. 955 Traxcavator with a Bureau of Mines approved Caterpillar exhaust conditioner for underground use. Other equipment to be displayed includes a D337 electric set; a DW21 and Athey PR21 Wagon.

• **CHICAGO PNEUMATIC TOOL CO.**

Featured will be the portable CP Power Vane 600-ft rotary compressor and a G-800 Tracdril, a mobile crawler mounted wagon drill. This equipment will be demonstrated. In addition, hydraulic boom arms, percussive and rotary type underground equipment, skid mounted diamond core drills, and a truck mounted seismograph rig will be shown.

• **CHIKSAN CO.**

Will show the newest addition to the Chiksan Intelli-Giant line, the 4-in. Intelli-Giant Model MH-4. Successfully used in hydraulic mining, slurring, stripping, earth-rock compaction, and other pressure jet operations, the unit features one-man operation.

• **CHRISTENSEN DIAMOND PRODUCTS CO.**

Outstanding cores collected in recent years will be displayed. Visitors will be able to examine diamond bits and core barrels designed to gain the best possible performance under either adverse or normal drilling conditions.

• **COAST MFG. & SUPPLY CO.**

Will use its booth as a hospitality area to enable friends and acquaintances to "take five" from their inspections and deliberations.

• **COLORADO FUEL & IRON CORP.**

Will feature a hospitality center—a complete secretarial service will be available to write letters, send telegrams, place and receive long-distance calls, and help with hotel

SPONSORS

(Not exhibiting, but actively supporting the Mining Show)

AMERICAN BRATTICE CLOTH CORP.
AMERICAN CYANAMID CO.
AMERICAN PULLEY CO.
APACHE POWDER CO.
BIRD MACHINE CO.
CATALYTIC CONSTRUCTION CO.
CLIMAX MOLYBDENUM CO.
FALK CORPORATION
FIRESTONE TIRE & RUBBER CO.
FISHER CONTRACTING CO.
FLEXIBLE TUBING CORP.
GENERAL CABLE CORP.
HOUGHTON & Co., E. F.
IRWIN FOUNDRY & MINE CAR CO.
KANSAS CITY STRUCTURAL STEEL CO.
KROGH PUMP & EQUIPMENT CO.
LAKE SHORE, INC.
LANG CO., THE
MINE & SMELTER SUPPLY CO., THE
NATIONAL ELECTRICAL COIL CO.
NORTHWEST ENGINEERING CO.
PETERSON FILTERS & ENGINEERING CO.
REEVES PULLEY CO.
SPRAGUE & HENWOOD, INC.
STEARNS-ROGER MANUFACTURING CO.
THERMOID COMPANY
TROJAN POWDER CO.
WESTERN MACHINERY & ENGINE CO.

and transportation reservations. A place to sit down and relax will be available and a drinking fountain will be at the disposal of all who wish to use it.

• **CRUCIBLE STEEL CO. OF AMERICA**

Highlighted by huge Eriez permanent magnet from which company products will be suspended, Crucible will display hollow and solid drill rods, Max-el machinery steel, 13 percent manganese steel, permanent magnets, Accumet and Crucast steel castings, Rexwel hard surfacing electrodes, railroad and industrial springs, and tool and high speed steels.

• **CUMMINS ENGINE CO., INC.**

Will feature the Cummins PT fuel system and a new model Turbodiesel. The new engine develops 335 hp. Cut-aways of Turbodiesel engines, along with the VT-12, rated at 600 hp, will also be shown.

• **DART TRUCK CO.**

Will exhibit two haulage units—a 25-ton truck and a 35-ton truck. Both are end dumpers and are single rear axle trucks. The 25-ton unit was shown at the American Mining Congress show in Denver in 1952, and has seen many thousand hours of open pit haulage during the last four years. It has an interesting story to tell.

• **DENVER EQUIPMENT CO.**

A full size Denver type "M" flotation machine will be shown in operation. A Denver automatic sampler and a reagent feeder—both operating—are also to be shown, along with a number of Denver rubber-lined sand pumps.

• **DETROIT DIESEL ENGINE DIV.,
GENERAL MOTORS CORP.**

New models to be distributed by Detroit Diesel include four- and six-cylinder Turbopower models, the 6-110 Roots Blower engine, and a 125-KW generator set. Also on display will be a unit equipped with General Motors' new Hydrostarter and a fan-to-flywheel unit with a GM torque converter.

• **DORR-OLIVER INCORPORATED**

Exhibit will feature the application of Dorr-Oliver equipment to various unit operations involved in processing uranium ore in the major producing areas of the world. An illuminated flowsheet of a typical Colorado Plateau mill supplemented by plant photographs will graphically illustrate the major treatment steps and equipment in which each is carried out. Also highlighted will be D-O equipped uranium mills in other parts of the world, and a complete line of D-O equipment and services available to the mining industry.

• **DOW CHEMICAL CO.**

Plans to feature Separan 2610. Separan's flocculating action will be featured in two working miniature thickeners. Other chemicals to be shown are assay test potassium bromide, magnesium oxide and hydroxide, ammonia, sulfur dioxide, glycols, and chloroform.

• **DU PONT DE NEMOURS & CO., INC., E. I.**

The du Pont exhibit will stress the value of research in developing and improving the various blasting products, supplies and accessories needed by the mining industry in their search for economical methods of recovering ores.

• **EDISON, INC., THOMAS A.**

The inside story of the all steel construction of Edison nickel-iron-alkaline cells will be told. A number of cut-away cells and animated displays will point out the component parts and rugged construction of the cells.

• **EIMCO CORP., THE**

Plans to show trackless mine-loading equipment in its 630 and 105 classes. New equipment in both lines will be shown for the first time. In the 630 size, Eimco will have an air-powered bulldozer and air-powered loader for normal and low headroom work. The 105 size equipment display will include tractor-bulldozer, tractor-excavator, and tractor-loader units.

• **ELECTRIC STEEL FOUNDRY CO.**

Will feature its wear-cap adapter, and triple-tapered dragline buckets and Esco shovel dippers.

• **ELECTRIC STORAGE BATTERY CO., THE
EXIDE INDUSTRIAL DIVISION**

Exide-ironclad batteries for mining service will be featured. Cutaway cells will show the use of silvium in the extensive use of polyethylene in the construction of Exide-Ironclad positive plates.

• **ENGINEERING & MINING JOURNAL**

Display will illustrate the varied services E&MJ offers the world-wide metal and nonmetallic mining industry.

• **ENGINEERS SYNDICATE, LTD.**

Plan to feature its new development, the Tattle-Tale, an all-purpose instrument for ground or airborne use in making thorium determinations, drill hole probes, and for combination scintillation and geiger counting, and radiometric assaying. Included in the exhibit will be the latest

in geophysical instruments and supplies including a laboratory magnetite stripper in operation together with an educational display of heavy mineral fractions extracted from western alluvial deposits.

• **EQUIPMENT ENGINEERS, INC.**

Both single and integral two-stage Krebs cyclones will be featured. Krebs valves and Clarkson reagent feeders will also be on display. Of interest will be a new air-adjustable apex valve for cyclones.

• **EUCLID DIVISION,
GENERAL MOTORS CORP.**

The Euclid exhibit will display three units representative of its line of earthmoving equipment. The TC-12 crawler tractor with its new cable controlled blade will be exhibited for the first time in the West Coast area. Also shown will be the Model 63TD 22-ton rear dump truck and the Model TS-18 twin-powered scraper.

• **FAIRCHILD AERIAL SURVEYS, INC.**

Designed to stress the airborne geophysics phases of Fairchild's aerial survey business, the exhibit will show a model airplane, trailing a magnetometer "bird". Under the plane, a typical geologic section will pass on an endless belt. Strip chart recorders, in actual operation, will draw the magnetometer record, the scintillation counter record, and the radar altimeter record that would be drawn in the plane as it passed over these geologic structures.

• **FIRTH STERLING, INC.**

Description not available.

• **FISKE BROTHERS REFINING CO.
LUBRIPLATE DIVISION**

Will exhibit their lubricating products for the mining industry. A mechanical display will illustrate the suitability of Lubriplate lubricants for mining machinery.

• **FLEXIBLE STEEL LACING CO.**

Exhibit will be built around a conveyor carrying a 24-in. belt joined with Flexco fasteners. Flexco speed drills and Rema conveyor belt repair materials will be demonstrated.

• **GALIGHER CO., THE**

A wide variety of pump sizes ranging with capacities from 10 to 3500 gpm will be featured. New models include the 4 by 6-in. Vaseal pump with replaceable rubber liners and the 2½-in. Galigher acid-proof sump pump.

• **GARDNER DENVER CO.**

Will exhibit its complete line of drifter drills, including specially built machines for blast hole work, sectional (coupled) drill steel and accessories. Also to be shown are feed leg drills, stoppers, and air hoists.

• **GENERAL ELECTRIC CO.**

Exhibit will highlight G-E products, systems, and services. Products include locomotives, motors and controls for shovels, draglines, hoists, crushers, ball mills, conveyors, and flotation cells. Transformers, switchgear, rectifiers, and cable for power distribution and conversion, floodlights, and two-way radio are the systems to be displayed. Services included GE products handling, GE application service engineering, and GE service shops.

• **GOODMAN MANUFACTURING CO.
DIAMOND IRON WORKS DIVISION
MANCHA STORAGE BATTERY LOCOMOTIVE DIVISION**

Featured will be three mine locomotives—1½-ton storage battery unit for tramping, a 6-ton storage battery

unit for heavy hauls, and a 2-ton diesel unit with removal cab for small shafts. Also shown will be a section of Goodman's new wire rope belt conveyor and a Holman Dryductor rock drill.

• **GOODRICH CO., THE B. F.**

INDUSTRIAL PRODUCTS DIVISION

Featured will be a small working model of the company's Turnover conveyor belt system. The model demonstrator shows that wet, freezing or corrosive materials can't build up and cause expensive damage to pulley and idlers. In addition, samples of belting and practically every kind of hose used in the mining industry can be seen. A full sized rotor and stator used in a Fagergren flotation machine showing the rubber tubes will be on display, and corrosion resistant rigid Koroseal sheet and pipe will be shown.

• **GOULD-NATIONAL BATTERIES, INC.**

Among the equipment to be exhibited will be a 48-cell, 13-plate KLZM type battery for powering underground haulage. In addition, standard mine type batteries will be on display as well as exhibits showing the construction of Gould batteries.

• **GRIPHOIST, INC.**

Will feature the Griphoist, a portable, manually operated cable hoist.

• **HARDINGE CO., INC.**

A working model of the new Hardinge disc roll mill will be the main item of interest. The operating model is built to scale and illustrates the grinding and air classifying action of the complete disc roll mill classifier system. Also on display will be working models of the Hardinge Tricone mill and the Auto-Raise thickener.

• **HARNISCHFEGGER CORP.**

Exhibit will feature working models and movies to point up the distinctive features of P&H electric shovels. Also displayed will be a model P&H magnetorque controlling the swing motions of a miniature shovel to demonstrate this P&H application of magnetic coupling. The exhibit will be rounded out by the display of a diesel engine and a model of WN-180 gas engine welder.

• **HAWTHORNE, INC., HERB J.**

Will feature five versatile bits to meet all drilling needs in the size range from 1 1/16-in. through 13-in.

• **HERCULES MOTORS CORP.**

Plans to feature its new line of gasoline and diesel engines. The D.D.339 and G.O.339 diesel and gasoline, six-cylinder engine will portray the interchangeable features of this line. In addition four- and six-cylinder power units will be shown, as will a cutaway engine of the four-cylinder turbulence-chamber type diesel engine DIX4D.

• **HERCULES POWDER CO.**

Exhibit will depict the wide range of Hercules' explosives and blasting supplies for the metal mining industries including King-size cartridges.

• **HEWITT-ROBINS INCORPORATED**

Will feature its hi-G vibrating screen and a "Jones" speed reducer. The hi-G screen will be a 6 by 24-ft model. The speed reducer will be a herringbone gear type with a ratio of 33.1 to 1.

• **HOMELITE**

A DIVISION OF TETRON AMERICAN, INC.

Highlighting the exhibit of "carryable" pumps, generators, and one-man chain saws will be the new Homelite-

Bosch heavy duty rock drill. The drill is electric-motor driven and operates from a 125-lb Homelite generator.

• **HOUGH CO., THE FRANK G.**

Will feature a model HO "Payloador," a four-wheel drive tractor-shovel.

• **HOUSTON TECHNICAL LABORATORIES**

Plans to feature the Worden Gravity Meter, a 5 1/4-lb unit designed to make possible reflection surveys over a depth range from very near the surface to 2500 ft, and deeper in special cases.

• **HUMPHREYS INVESTMENT CO., THE**

Exhibit will feature an operating Humphreys spiral concentrator showing the separation of titanium and other heavy minerals from the sand in which they occur.

• **INGERSOLL-RAND CO.**

Will display new designs in three sizes of the Drill-master down the hole drill, Carset jackbits, self-propelled hydraulic drill mountings, jackdrills, roof bolting equipment, jackbit grinders, mine hoists, rotary portable compressors and a new torque control Impactool for roof bolting will also be shown.

• **INTERNATIONAL HARVESTER CO.**

Will display an International 400 tractor with Pippin backhoe, an International 300 tractor with front bucket, an S-120 4-wheel drive pickup truck, a 6-wheel dump truck, a TD-24 crawler with dozer, a TD-9 crawler with Drott steel mill and mining special skid-shovel, a UD-350 power unit with a Palmer generator, and a V-282 power unit.

• **INTERNATIONAL NICKEL CO., INC.**

Exhibit will depict the many uses of nickel and nickel alloys in the mining industry. Included will be applications in grinding mills, liners and pumps and steam shovels.

• **JAEGER MACHINE CO., THE**

Will show a Model 600 rotary air compressor powered with a GM 4-71 diesel engine. A cutaway of a Jaeger rotary air compressor will be used to show its design and construction. Also displayed will be a four-in. electric pump typical of the Jaeger line of 1 1/2 to 10-in. self-priming centrifugal pumps.

• **JEFFREY MANUFACTURING CO., THE**

Will feature its line of equipment for the mining industry. Equipment on display will include an electric vibrating grizzly feeder, a Flextooth slugger crusher, a magnetic separator, four mechanical vibrating conveyors and two electric vibrating feeders conveying material in a run-around circuit, a four-ft Aerodyne fan with shaft-mounted motor, an Aerodyne midjet fan and blower, standard and loading sections of 30-in. underground belt conveyor with various types of idlers, a Perma-Seal belt idler under a dry sand test to demonstrate bearing seal, and drive and conveyor chains.

• **JOY MANUFACTURING CO.**

Will exhibit several new products for the first time. Of interest to mill and refinery personnel is Joy's new Microdyne dust collector, a wet inertial type collector for installation directly in a duct line. The Joy single-roll, suspension-type Limberoller conveyor idler and conveyor belt will be in operation. Two new drills, the Junior Challenger, a self-propelled track-mounted drill for 3 1/2-

in. diameter holes, and the TWM-5 Challenger, a crawler mounted for drilling both vertical and toe holes with hole diameters up to 4½ in. will also be on display. Two new diamond core drills will be introduced, the No. 25 underground column mounted drill and the No. 22 heavy duty truck mounted drill. Also shown will be the new airleg for the LM-47 rock drill, new types of rock bits, the Grapple shaft-mucker and other underground machines.

• **KENNAMETAL INC.**

Percussion bits for hard rock drilling will be featured. In addition to the bits, ranging in size from 2¾ to 5-in., the company will also highlight tungsten carbide balls for ball milling, a complete line of mining tools and rotary drill, cutter, core and drag bits.

• **KENWORTH MOTOR TRUCK CO.**

Will exhibit two rear dump earthmoving trucks. Model 802 is a 24-ton spring mounted truck with a 16-yd struck capacity. Model 803 is a 36-ton, 24-yd capacity truck.

• **KOEHRING CO.**

Will feature two haulage units. One, the Koehring Dumptor, is a six-cu yd capacity off road haulage unit for operation along narrow haulways, haul roads, in tunnels, or on overhead trestles. The company's Moto-Bug will be shown publicly for the first time. This unit has three interchangeable front end attachments, a hopper, a platform, and a fork lift attachment.

• **LE ROI DIVISION
WESTINGHOUSE AIR BRAKE CO.**

Will have many of its products designed for the mining industry on display. Included will be Le Roi-Cleveland air legs, a new lightweight stopper, and a new model S-20 stopper with dust collector. Also shown will be a Le Roi Model 125 tractor with Le Roi-Cleveland mobile drill equipped with the new DR40 feed. The exhibit will be rounded out with a variety of modern hand-held tools and the new pneumatic bit detacher.

• **LESCHEN WIRE ROPE DIVISION
H. K. PORTER CO., INC.**

Will have on display numerous samples of its various types, sizes and construction of wire rope used in mining operations. Also shown will be a number of Red-Strand wire rope slings.

• **LeTOURNEAU-WESTINGHOUSE CO.**

Will feature four earthmoving tools which are applicable to the metals mining industry. A 150-hp heavy-duty grader, a Model C Tournatractor with down pressure dozer blade, a Model B rear dump with newly designed quarry body, and the Model C Tournapull with C Fullpak Scraper will be shown. This will be the first public appearance for the C-Fullpak Scraper.

• **LINK-BELT CO.**

Materials handling systems and power transmission equipment for the metal mining industry will be emphasized. Highlighted will be a model of a 275-ft radius belt conveyor stacker now being installed to stockpile taconite pellets. Also, belt conveyor idlers, a parallel shaft gear reducer, and allied power transmission products.

• **LONGYEAR CO., E. J.**

Exhibit will feature a model of the Longyear Wire Line and other core barrels to illustrate the importance of good core recovery. The Model 44 diamond core drill for deep hole drilling, the light Model 24 drill, a diamond drill pump, and a display of diamond bits will also be shown.

• **LOS ANGELES SCIENTIFIC INSTRUMENT CO.**

Exhibit will include a complete line of surveying equipment including optical theodolites, optical plummets for ceiling and floor centering, automatic levels, optical planimeters and other unique instruments.

• **LUDLOW-SAYLOR WIRE CLOTH CO.**

Samples of abrasion-resistant woven wire screens and wire cloth, including a wide variety of square and long openings in various wire diameters up to one in. thick, will be displayed. A model showing fine mesh wire cloth with hook-stripped edges for easy installation on tensioned vibrating screens will be on display as will coarser meshes with hooked edges for coarser sizing or for supporting fine-mesh sizing screens.

• **LUKENS STEEL CO.**

Exhibit will feature its line of clad and alloy steels for materials handling and process equipment in the mining industry. The use of Lukens "T-1" for resistance to impact their abrasion will be emphasized by on the job performance data.

• **MACK TRUCKS, INC.**

Exhibit will feature a 68,000-lb payload capacity six-wheeled chassis, Model LRVSW, equipped with a Heil 24-yd rock body and 70° hydraulic hoist.

• **MARION POWER SHOVEL CO.**

Plans to display its new 35-MR ¾-yd truck crane designed for general utility work around mining operations.

• **MINE SAFETY APPLIANCES CO.**

Will feature the Edison electric cap lamps and the latest on mine communications systems. Both the MSA MinePhone and MSA HoistPhone will be shown. Rounding out the display will be a complete line of safety equipment for the metal miner.

• **MINING CONGRESS JOURNAL**

Official publication of the American Mining Congress invites the foot-weary visitor to "set and rest". The exhibit will feature MCJ's service for the entire mining industry.

• **MINING ENGINEERING**

Will have literature and copies of its various publications for the mining industry.

• **MINING WORLD**

The exhibit scene will feature diamonds. A large bowl of synthetic diamonds will be on display against a backdrop of mining photographs taken from all over the world.

• **MOBILE DRILLING, INC.**

Will have on display its two largest drills. One, the Model B-40, is a completely new, all-hydraulically powered core or auger drill that can be used for under-road boring and is adaptable for P.T.O. use on vehicles and tractors or independently driven by a vehicle-mounted engine. Model B-52 is a heavy-duty drill, complete with a Ford industrial-type engine and can be used for rotary, auger or percussion drilling.

• **MORAN ENGINEERING CO.**

Will display a newly designed battery locomotive with Magnetrol drive—an electro-magnetic torque and speed control which gives power acceleration and deceleration, forward and reverse haulage from a single lever.

• **MORAN INSTRUMENT CORP.**

Exhibit will be devoted to displaying some new type gamma ray and logging instruments and portable electronic surveying equipment.

• **MULTI-METAL WIRE CLOTH CO., INC.**

Plans to show all types of metallic filter media and screens, filter leaves and tubular filter elements, and other related materials used in filtering and screening operations.

• **NATIONAL FILTER MEDIA CORP., THE WESTERN DIVISION**

The company's line of filter fabrics and filter paper will be featured. Samples of over 300 fabrics and papers will be available for examination. Also on display will be fabricated filter covers and dust collector bags.

• **NATIONAL MALLEABLE & STEEL CASTINGS CO.**

Exhibit will include a complete assembly of its newest railroad coupler, the Type F interlocking coupler, with attachments and National multi-pad rubber cushioning device. Also displayed will be the company's line of cast alloy steel grinding balls, other castings for the mining industry, Willison automatic couplers, and the National NC-1 mine car truck.

• **NATIONAL SUPPLY CO., THE**

Will exhibit a full-sized, cutaway, operating model of its new heavy duty torque converter. Principles of operation of these converters can be seen through cut-out sections of the case and the cast aluminum hydraulic elements of the converter.

• **NORDBERG MANUFACTURING CO.**

Exhibit will feature the full line of Nordberg and Symons machinery for the mining industry, including mine hoists, power-generating diesel engines, primary gyratory crushers, short head and standard type cone crushers, vibrating screens and grizzlies and grinding mills. A feature of the display will be operating scale models of the Symons cone crusher, vibrating bar grizzly, vibrating rod grizzly, and the vibrating rod deck screen.

• **OHIO BRASS CO.**

O-B Magna-Trip Circuit Interrupters and a complete display of overhead trolley wire fittings, aluminum and copper feeder cable fittings, rail bonds, and collectors for locomotives will be featured. Fused taps and rail clamps will be shown, as will expansion shells and plugs for roof bolting.

• **OLIN MATHIESON CHEMICAL CORP. EXPLOSIVES DIVISION**

Will have on display a complete line of Olin Explosives.

• **ORE & CHEMICAL CORP., THE**

Exhibit will feature a working model of OCC's Heavy Media separatory vessel.

• **PIONEER ENGINEERING WORKS, INC.**

A one-fourth scale model ore and aggregate crushing, screening, and sizing plant will be in operation. Chutes and dampers are included which enable the production of six sizes of material simultaneously. Principle products of the company for the mining industry will be illustrated by the model plant.

• **PIT & QUARRY PUBLICATIONS**

Will outline its many and varied services to the quarrying and mining industries.

• **PRODUCTIVE EQUIPMENT CORP.**

Plans to exhibit a 4 by 10-ft two-deck base mounted Gyroset screen.

• **QUAKER PIONEER RUBBER MILLS**

DIVISION OF H. K. PORTER CO., INC., OF PITTSBURGH

Featured will be conveyor belts and idlers with a working model conveyor. New products to be shown will be Super "H" hot material belting, Shockmaster general service belts for shock resistance, and synthetic fabrics.

• **RAYBESTOS-MANHATTAN, INC.**

THE MANHATTAN RUBBER DIVISION

Featured will be the company's Poly-V Drive, a new type belt with specially designed pulleys to mate with the ribs in the belt. Also shown will be the company's latest conveyor belt developments and its line of hose and industrial rubber products.

• **REICH BROS. MANUFACTURING CO., INC.**

Will have on display a high speed prospecting drill equipped with both air and water for plug drilling as well as diamond coring. The drill will be mounted on a four-wheel drive truck with front-mounted winch to enable travel over rough terrain.

• **ROCK PRODUCTS**

Display will feature colored murals of outstanding non-metallic producer plants and will demonstrate the magazine's service to the mining industry.

• **ROEBLING'S SONS CORP., JOHN A.**

Exhibit will be devoted to displaying Royal Blue wire rope for all purposes and electrical wire and cable for industrial, mining, and utility requirements.

• **ROME CABLE CORP.**

A display of Rome 60 neoprene-sheathed portable mining cables will be featured. Included in the display will be the testing of twin conductor shuttle car cable for flexibility under tension.

• **ST. REGIS PAPER CO.**

Will display a four-tube Fluopacker bag filling machine. Included in the display will be containers for packaging various products.

• **SANFORD-DAY IRON WORKS, INC.**

Will show the latest model Gismo mucking unit for both production and tunnel work. In addition, tunnel driving drop-bottom ramp cars will be displayed as will a HKD, hoist used to pull mine cars by the loading points in the mine.

• **SHARPLES CORP., THE**

Featured will be a new dry powder classifier designed to combine cutpoint sharpness and high efficiency with high capacity. Also on display will be two centrifugal wet classifiers, a Heavy Duty DH-3 Nozzle discharge machine, and a scroll type Super-D-Canter.

• **SHEFFIELD STEEL DIVISION ARMCO STEEL CORP.**

Display will include cross sectional areas of Sheffield Moly-Cop grinding balls and samples of the progressive steps in their forging operations. A film will be used to illustrate the various manufacturing processes in the production, laboratory control and heat treating operations from the making of special analysis steel to the finished balls.

• **SIKA CHEMICAL CORP.**

Display will feature installations of the company's grouted type roof bolt in simulated drill holes. In addition, Sika compounds for sealing leakage, concreting, and grouting under all types of job conditions will be shown. These products include retarding, accelerating, and expansive compounds for concrete and grout.

• **SIMPLEX WIRE & CABLE CO.**

Will have on display its line of wire and cable products for the mining industry.

• **SOUTHWESTERN ENGINEERING CO.**

Will present its full line of products and services to the mining industry. The use of Sweco vibrating screen separators as continuous classifiers will be demonstrated and Sweco Heavy Media separation package plants will also be demonstrated.

• **SPENCER CHEMICAL CO.**

Will feature the use of the Akremite Blasting Process. Samples of ammonium nitrate used in the Akremite Process and literature describing the process in detail will be available.

• **STANDARD STEEL CORP.**

Will exhibit a large transparent working model of a rotary dryer section showing how Standard Steel lifters distribute the product in the interior of the dryer. Also shown will be samples of various products being processed in Standard Steel kilns, calciners, and dryers.

• **STEARNS MAGNETIC PRODUCTS**

A DIVISION OF THE INDIANA STEEL PRODUCTS CO.

Will exhibit a working model of the "WPD" Permanent Magnetic Drum for use in heavy media separation plants. The unit will demonstrate the principle of magnetic recovery by processing magnetite through the separator. In addition, a rectangular suspended magnet for removing tramp iron from the flow of material carried on conveyor belts will be displayed.

• **STEPHENS-ADAMSON MANUFACTURING CO.**

Component parts for belt conveyors will be featured. Included in the exhibit will be carriers, pulleys, drives, speed reducers, holdbacks, belt cleaners, Sealmaster bearings, and car pullers.

• **STOODY CO.**

Will have two welding machines in operation. One will be an automatic electric welding machine overlaying mining equipment with hard metal. The other demonstration will show a semi-automatic welder at work, depositing hard-facing alloys by means of Stooddy semi-automatic wires running open arc without flux. In addition a wide variety of hard-faced mining equipment will be on display.

• **STRATOFLEX, INC.**

Will exhibit its general line of detachable, reusable fittings and hose assemblies.

• **THOMAS FLEXIBLE COUPLING CO.**

Description not available.

• **THOR POWER TOOL CO.**

Plans to feature a new 3-boom rail-mounted rock drilling Jumbo. The three boom arms of the Jumbo will mount three different types of power feeds offered with the rig—an air-motor screw-feed shell; a chain-feed mast; and an air-cylinder feed. Rock drills up to 3½-in. bore will be mounted on the power feed.

• **TIMKEN ROLLER BEARING CO.**

Featured will be Timken's new line of tapered socket bits. Also shown will be the rest of Timken's complete line of rock bits, Timken bearings and parts for mine cars and mining equipment, and a display of Timken alloy steel and seamless steel tubing for mining equipment.

• **TOOL STEEL GEAR & PINION CO., THE**

Exhibit will feature cutaway sections of the various types of materials manufactured by the company for the mining industry.

• **TRAYLOR ENGINEERING & MANUFACTURING CO.**

Will use a photographic display to tell about its line of kilns, jaw crushers, TY reduction crushers, feeders and TC gyratory crushers.

• **TWIN DISC CLUTCH CO.**

Products to be featured include torque converters, fluid couplings, Hydro-Sheave drives, air clutches, friction clutches with rubber block drives, friction power take-offs, and other friction clutches.

• **TYLER CO., THE W. S.**

Featured will be the latest model Ty-Rock screen. Samples of woven wire screens of many different metals and meshes, along with a Ro-Tap testing sieve shaker and Tyler standard screen scale testing sieves, will complete the exhibit.

• **UNION WIRE ROPE CORP.**

Will feature the company's line of wire rope and wire rope slings used in the mining industry.

• **UNITED STATES RUBBER CO.**

Included in U. S. Rubber's line of materials for the mining industry that will be on exhibit are conveyor belts, power transmission belts, hose, plastic pipe, plastic pipe fittings and valves, sheet and rod packing, and splicing and friction tapes.

• **UNITED STATES STEEL CORP.**

Will tell an over-all "Service" story and feature the availability of "T-1" steel. Lorig self-centering units for the correction of improper belt tracking will be displayed as will mill liners, wire rope, electric mining cable, rail-bonds, sheets, tramway cable, nails and forgings.

• **UNIVERSAL ENGINEERING CORP.**

Will have a demonstration model of its Wobbler feeder on display. Also shown will be models of a Universal Impact Master, Impact-Reversible Center-Feed Hammer-mill, and a Pettibone Speedall tractor shovel.

• **VAREL MANUFACTURING CO.**

New Varel-Abrasive diamond coring bits for the mining industry will be introduced in an exhibit featuring rotary drilling tools. Other bits to be shown are two and three cone rock bits, tungsten carbide blade bits, cemented carbide blade bits, drag bits, small drill pipe and drill tubing.

• **VASCOLOY-RAMET CORP.**

Will display its complete line of carbide percussion bits in a full range of bit diameters in all popular thread types.

• **VICTAULIC COMPANY OF AMERICA**

Will exhibit and demonstrate the Victaulic method of piping. Featured will be Victaulic's variety of coupling styles for high and low pressure lines, for grooved pipe and for plain end pipe, for standard pipe and for light wall pipe and tubing.

• **VULCAN IRON WORKS CO.**

Will have on display three Vulcan-Denver double-drum electric slusher hoists, an all manganese slusher, a light-weight slusher scraper, a slope roller with replaceable rubber or neoprene tread rings, and a pneumatic Portocut chain saw.

• **WEDGE WIRE CORP.**

Display will feature Wedge Wire Kleenslot screens in different metals and openings.

• **WESTERN GEAR CORP.**

Will display herringbone speed reducers, straight-line reducers, right angle reducers, cone drive reducers, G. E. Pacific gearmotors, gears of various types, and will introduce several new types of gearmotors. Couplings of various types and specialized power transmission equipment for the mining industry will round out the exhibit.

• **WESTERN MACHINERY CO.**

Will have on display a 5 by 11-ft Wemco Remmer jig, a 44-in. Wemco Fagergren flotation machine, and a mechanism for Wemco high intensity agitator conditioners.

• **WESTERN PRECIPITATION CORP.**

Display will include the new Western Precipitation Corp. automatic voltage control which has been developed to maintain optimum voltage input to Cottrell precipitators to match changing operation conditions; an electric rapper for the collection sections of a Cottrell precipitator; and a Western Precipitation Holo-Flite processor, the heat-exchanger for such applications as cooling calcined ores following roasters and for drying ore concentrates. All units will be operated under simulated plant conditions.

• **WESTERN ROCK BIT MANUFACTURING CO.**

Feature attraction will be the first convention showing of the new Liddicoat Tee Cee bit, a tungsten carbide bit that is "drilled to destruction without resharping." Various types of Liddicoat bits and drill rod connections will also be exhibited, and a drill rod grinder will be demonstrated.

• **WESTINGHOUSE ELECTRIC CORP.**

Will show a power plant model demonstrating how uranium is used in a reactor. Also displayed will be elec-

tric motors and controls used in the mining industry for a wide variety of duties.

• **WHEELABRATOR CORP.**

Display will feature dust and fume control in the mining and metallurgical industries by means of Wheelabrator Dustube cloth-filter-type collectors.

• **WHITE MOTOR CO., THE**

Will have on display an early model White chain-driven truck representative of the early model trucks used in mining and quarry operation. By comparison a current model 20-ton capacity auto car truck with a heavy-duty quarry-type body will be on display. A 75,000-lb capacity planetary type rear axle will also be shown as will Industrial diesel engines made by the company for the mining industry.

• **WHITNEY CHAIN CO.**

Will exhibit its full line of precision chains for use on loaders, continuous miners, and shuttle cars.

• **WILD HEERBRUGG INSTRUMENTS, INC.**

Exhibit will feature Swiss precision-made optical surveying instruments, including a repeating transit with direct readings to 20 seconds. A transit with direct reading to one minute especially designed for mining use will be introduced. It has a repeating clamp, built-in optical plummet with upright image and can be equipped with mining attachments, including a battery box to illuminate, circle readings, the telescope reticule and, in addition, all level bubbles.

• **WILLYS MOTORS INC.**

Will have on display a Model CJ-5 Jeep, the first member of the "Jeep" family of 4-wheel drive vehicles.

• **WINTER-WEISS CO., THE**

Will feature the Portadrill Model 6TA tractor-mounted air drill, truck-mounted blast hole drills, and other Portadrill equipment for drilling blast holes, sampling, underground exploration, and water well drilling.

• **WORTHINGTON CORP.**

Description not available.

|| Mining Show

(Continued from page 72)

underground borax mine, where continuous miners and shuttle cars are employed, and the magnetic separation plant. The new plant facilities and the open pit mine now under development, which have attracted wide attention on the part of mining men throughout the country, will also be visited.

Don't Miss It

The 1956 Mining Show is certainly the industry's "big event" of the year. Ingredients that make it such include: the outstanding

general and technical sessions; the greatest exhibition of mining equipment the metal mining and industrial minerals industries have ever seen; the opportunity for all those interested in mining to rub shoulders, discuss the industry's problems and learn the latest developments; a round of sparkling entertainment, and a series of inspection trips to varied mining and mineral processing operations.

Yes, it can be truly said that the Mining Show in Los Angeles will be another momentous affair in the grand tradition of American Mining Congress meetings.

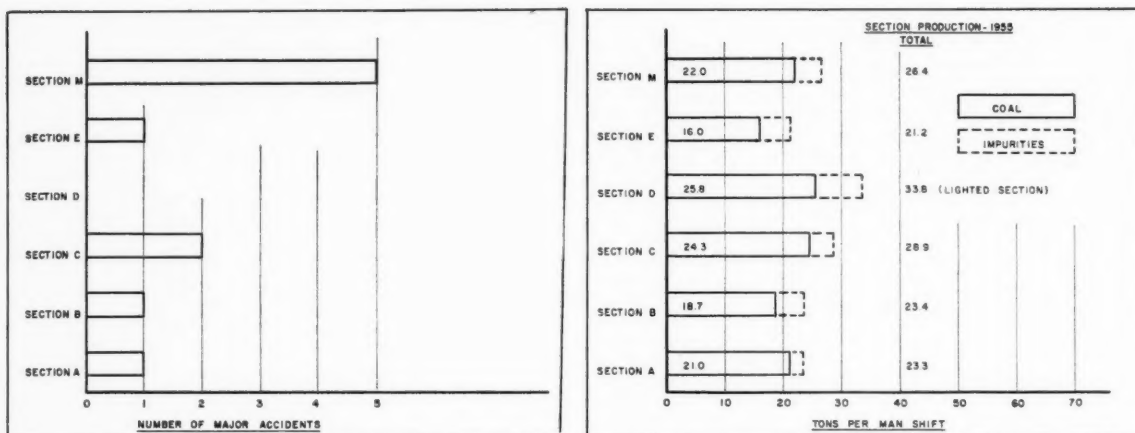


Fig. 1, on left, indicates the total number of major accidents in various sections of the Dorothy mine from May 1955 to May 1956. Fig. 2, on the right, shows production in terms of tons per man shift during the same period on the same sections. Section D is the lighted section in both cases

Mine Lighting Improves Safety and Production

"We believe the lighting of the active working area of coal mines has many advantages and that these advantages may well exceed expectations"

By S. P. CARTER
Superintendent of Maintenance
Coal Division
Armco Steel Corp

THE level of illumination in coal mines has always lagged far behind that of other industries. . . . We in the coal industry have come to accept this as a matter of fact without very much thought as to why this condition exists.

It is believed that there is a direct relationship between the level of illumination and the accident frequency rate of any industry. In every industry where there has been a substantial improvement in illumination there has also been a corresponding decrease in the accident frequency rate of that industry. In a comparison with other industries, coal mining has the lowest level of illumination and one of the highest accident frequency rates.

The miner's electric cap lamp first appeared in coal mines in 1915; however, it was not universally accepted in the mines of this country until the

early 1930's. While the electric cap lamp furnishes a cone of light of relatively high intensity within the cone, outside this cone the intensity is practically nil. We must remember that the electric cap lamp was designed to furnish illumination for the individual miner when he was working by himself in a single place. The extent of his moving equipment was his hand auger; the extent of his work area was largely the six ft between the end of the mine car and the face of his working place. The electric cap lamp served this miner well, and it has performed a tremendous service for the coal industry.

Let us now take a look at our miner of 1956. He is no longer confined to a single working place, but he is moving continuously in a cycle from one place to another. He may be working in as many as 12 different places within a single shift. As his means of

production he has large, highly mobile, fast moving machines. Due to the noise of the machinery, he can no longer make use of his sense of hearing as a means of detecting changes in roof conditions. There may be as many as five or more men concentrated in one place, in a confined space, each man performing a separate operation; yet all working in close proximity to powerful fast moving machinery; and under rapidly changing physical conditions. Each miner must not only see what he is doing, but must also be able to see the other workmen and to see the changes that are taking place around him.

Need for Better Light

Development of mining machinery and the changes in mining methods have progressed at a very rapid rate during the past ten years. This mechanical revolution in mining machinery has caused us to change our methods. Changes in methods create problems. If we look closely at our mine lighting, I believe we can say that it has not kept pace with our changes in methods. There is a need for more light and a wider distribution of light than can be furnished by the present day miner's electric cap lamp.

This problem would be very simple, if we could requisition a mine light-

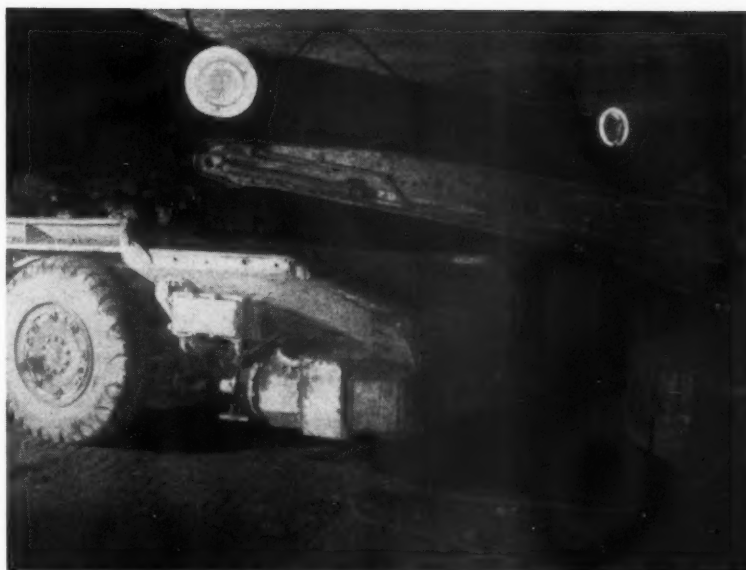
ing system from our Supply Store shelf, or order one from our electrical distributor or our mining machinery manufacturer. The facts are that no such lighting system is yet available.

The design of an approved mine lighting system, one that will be effective, one that will be practical for use underground, is one of the most difficult tasks ever given to a design engineer. The restrictions placed on a lighting system for face illumination of a coal mine are tremendous. We need a safe, practical, mine lighting system, yet the requirements are so severe that the design of such a lighting system is an almost impossible task. Good practical mine lighting is not compatible with our conditions, methods, and restrictions. This is the problem in mine illumination.

Project Started in 1953

The Board of Directors of Bituminous Coal Research, Inc., recognizing the need for better illumination in the active working area of coal mines, authorized a mine illumination project by the Development Committee of this organization in 1953. This project had as its objective the determination of the feasibility and practicability of lighting the active working area of a coal mine. This was the beginning of what has become known as "Area Lighting in Coal Mine".

The development, experimentation, and the first installation of an area lighting system under this project was at the Owings Mine of the Consolidation Coal Co. at Owings, W. Va. Here it was proved that the active working area of a coal mine could be



Spaced 15 ft apart, the light fixtures provide area illumination which makes the job of maneuvering equipment easier

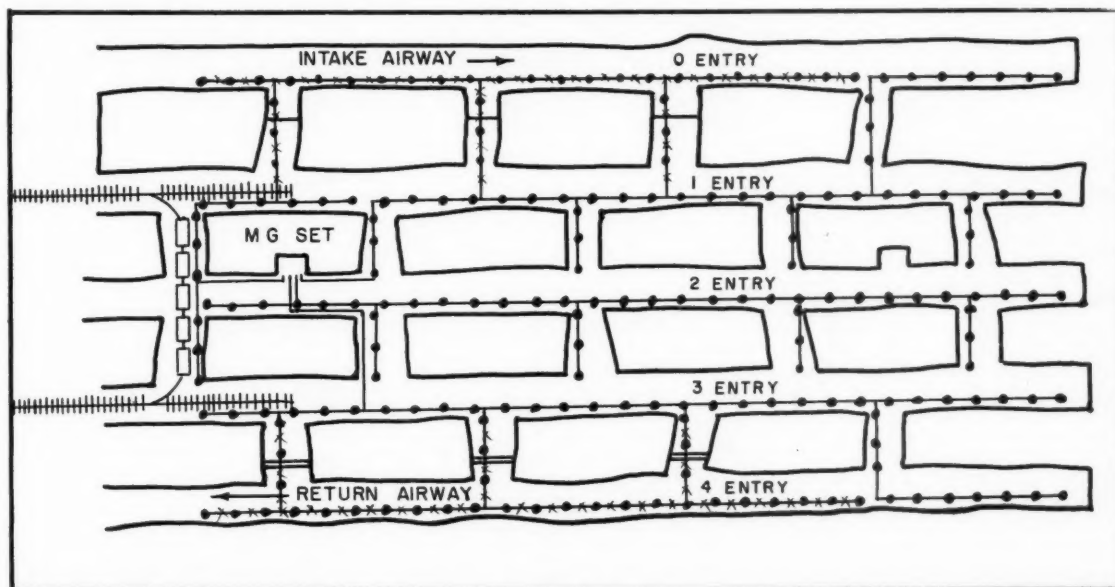
successfully illuminated. The second phase of this project was to evaluate the lighting system developed at the Owings Mine to determine the advantages, disadvantages, and the problems encountered in the operation of this type of lighting system.

Moved to Armco

The lighting equipment was moved from the Owings Mine to the Dorothy Mine of Armco Steel Corporation, Montcoal, W. Va., in May 1954. The system had been in continuous operation on the same section of the Doro-

thy Mine since May 1954 with no attempt to alter or improve the equipment.

The mining plan used in the Dorothy Mine is the conventional room and pillar system of mining. Entries are driven 18 ft wide on 50-ft centers in sets of four and five entries abreast. Crosscuts are driven on 110-ft centers and are also 18 ft in width. The pillar blocks are 32 ft wide by 82 ft long. Rooms are driven on the same centers and in the same manner as the entries. There are six production sections operating in this mine.



Section map showing location of lights. Those in the two outside entries are moved forward as soon as new breakthroughs are made since these entries are not traveled behind this point

The seam of coal has an average height of approximately six ft. There is a hard-slate parting near the middle of the seam which will vary in thickness from a few inches in some localities to as much as three ft in other places. The thickness of the coal seam, above and below the parting, is fairly constant and the roof height varies according to the thickness of the parting. Full-seam mining is practiced.

The mining equipment used in the lighted section is conventional off-track equipment consisting of one rubber-tired universal cutting machine; one crawler-mounted loading machine; a hand-held hydraulic coal drill; one rubber-tired rotary roof-bolting drill; two rubber-tired shuttle cars; and one car-spotting hoist. The shuttle cars dump directly into mine cars. Mine cars are placed on and removed from the section by the main line haulage crews.

The Lighting System

The mine lighting system has only three separate components; namely, the light fixture, the power cable, and the power conversion unit.

The lighting fixture is a modified household fluorescent circline fixture. The unit weighs six lb and is approximately 13 in. in diameter. The fluorescent tube is a 12-in, 32-watt, 115-volt, 60-cycle, circline lamp. In the back cover of the fixture is mounted one incoming power receptacle and two outgoing power outlets.

A trigger-start ballast unit for operation of the tube is mounted inside the back cover and weighs approximately two lb. This unit requires approximately one ampere of current and operates at about 50 percent power factor.

The power cable is composed of three conductors of number ten-gage wire with a suitable jacket. Each section of cable is 16 ft long with a three-conductor male plug on one end and a mating female plug on the other end. One length of cable is required for each lamp installation. The male plug attaches directly to the power supply outlet; the female plug goes to the incoming power receptacle in the back of the light fixture.

The power unit consists of a 25-hp, 1800-rpm, 250-v, direct current motor, coupled directly to a 3-phase 120/240-v, 60-cycle, 18.75-kva alternating current generator. The controls for the d-c driving motor, the controls for the a-c generator, and the power distribution panel for the lighting system are all mounted on a frame which is attached to the base plate of the motor generator set. This unit is capable of furnishing power for 270 lamps. Each of eight outlet circuits is protected by a 30-amp, thermal magnetic circuit breaker.

Skid mounted, the power unit may be pulled on the mine floor by a shuttle car to the new location, or it can be loaded into the shuttle car and hauled to the new location.

When the lighting system is set up on the section the motor-generator set is located in an offset in the left-hand rib of the center entry about 50 ft in by the mine car loading station. Four main-lighting circuits are taken from the power distribution box to light the section. There is one circuit for each of the three inside entries. The fourth circuit lights the mine car loading point and the supply yard. Each of the outside entries is lighted from the same circuit as its adjacent inside entry. The two outside entries have lights only from the last open crosscut to the face since there is no work or travel in the two outside entries outby the last open crosscut.

Thirty lights are required for each of the three inside entries when they

motor-generator set is moved forward for a new set-up. The motor generator and the mine car loading station are advanced in 300-ft steps.

The 15-ft spacing of the fixtures gives an average light distribution of from one- to two-ft candles along the left-hand rib and in the active working area of the faces. It is believed that this is a minimum acceptable value for area mine lighting, and that additional light is needed in the active working faces.

What Have the Lights Meant

Figure 1 shows the major accident record of the production sections of the Dorothy Mine from May 1954, when the lights were installed, to May 1956. Three of the sections each had one accident; one section had two accidents; one section had five accidents; Section "D", the lighted section, did not have an accident during this period.



Lights are carried right up to the face

have been advanced a maximum distance of 450 ft from the mine car loading station. Seven lights are required for each of the outside entries and three lights are installed in each open crosscut.

Lights in the entries are suspended from the roof or timbers about three ft from the right-hand rib. Approximately two minutes is required for installation of a fixture and cord. Lights in the crosscuts are suspended along the outby rib of the crosscuts.

The maximum number of lights in use at one time is 140. The maximum floor area illuminated in the set-up is 37,784 sq ft with an average of 252 sq ft of floor area illuminated per lamp.

The minimum number of lights in use is 62. This will occur when the

A comparison of the production performance of the six sections of this mine for the year 1955 is shown in Figure 2. The lighted section produced more tons of clean coal per man shift than any of the other sections and this section also handled the largest tonnage of impurities. The total tonnage handled per man shift by the lighted section was 17 percent above that of the next higher production section.

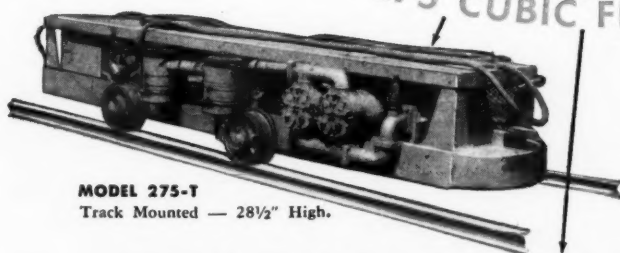
It is difficult to measure the results of any lighting system, yet we know this lighting system is a definite aid to the foreman in that it gives him a wider over-all vision of the different operations that are going on in each face of the section. The lights are particularly helpful to the loader
(Continued on page 127)

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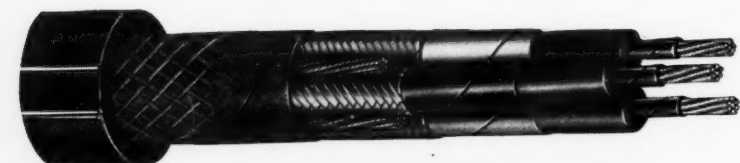
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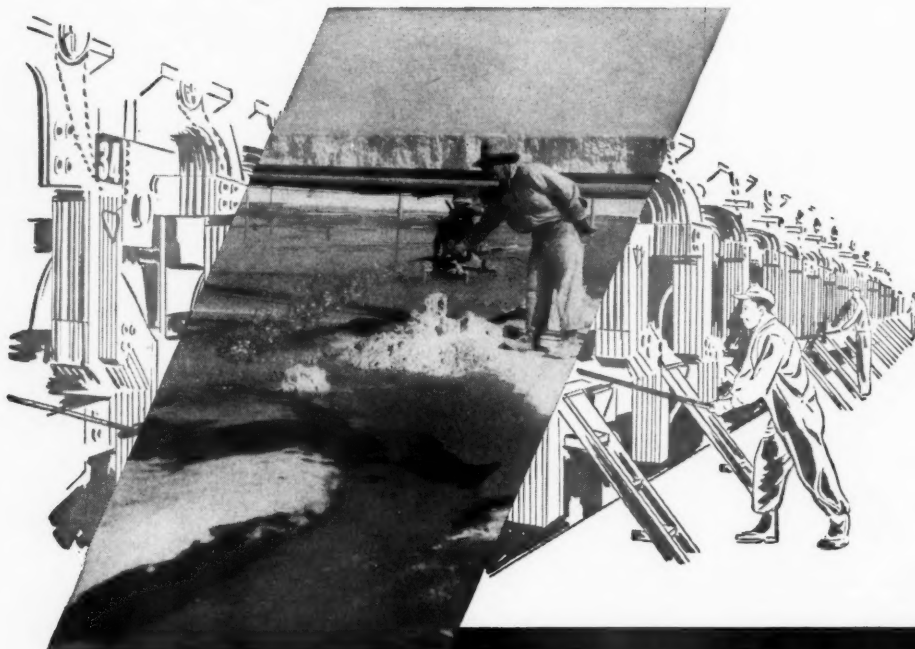
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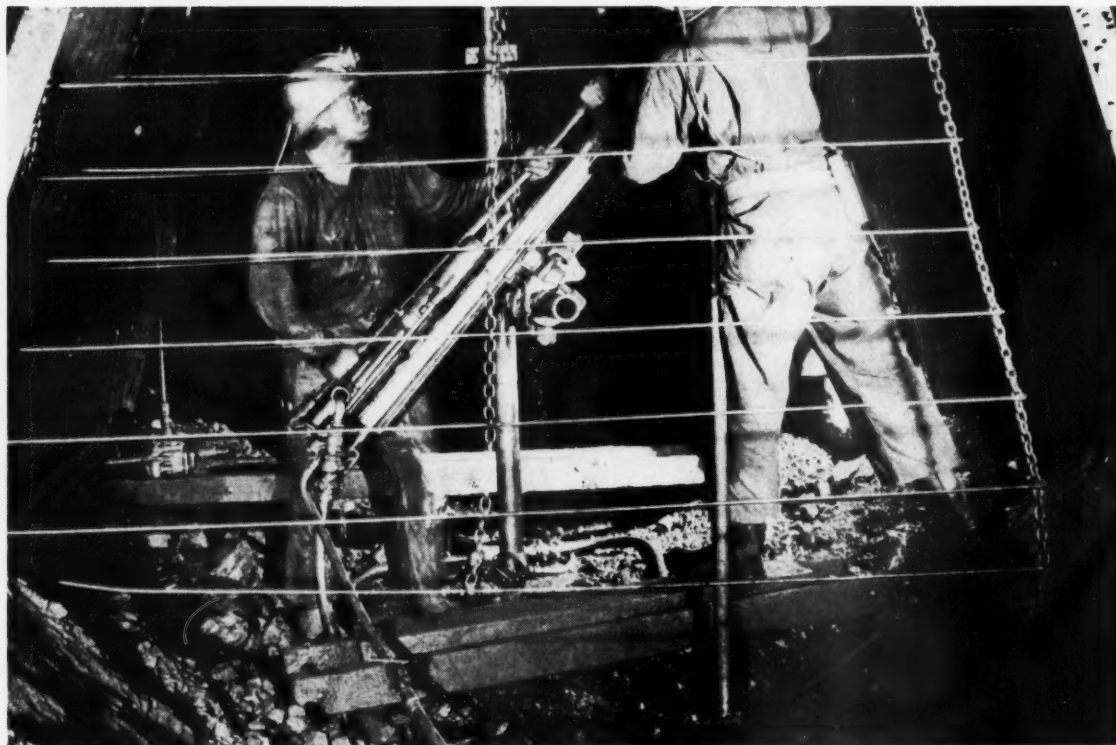


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Safety in Block Caving



The use of long strings of drill rods presents a number of hazards which must be constantly guarded against.

An iron mine's efforts to develop a safe mining program are described. Particular hazards that had to be overcome were danger from falling material, handling of long strings of heavy drill rods, blasting in transfer drifts while working in an adjacent drift, charging and blasting long holes, possible failure of pneumatic columns and slusher ropes and blocks

IN ground that will not tolerate large openings many underground iron mines have turned to adaptations of block caving and shrinkage stoping in an attempt to obtain the safety and efficiency connected with long hole drilling.

Rising labor costs have accelerated experimenting in the general problem of block caving and shrinkage stoping in an attempt to obtain the safety and efficiency connected with long hole drilling.

We believe that block caving was originally used at the Chapin Mine in Iron Mountain, although this is subject to a good deal of argument, but we know that our mining competitors

By F. J. HALLER
Vice-President—Operations
North Range Mining Co.

in the West were considerably ahead of us in the adaptation and development of this system. More recent attempts at block caving in the Lake Superior District were started on the Marquette Range about ten years ago. During the intervening time, there have been many improvements over the original attempts, particularly in the support of the transfer or scraping drifts and in the preparation of the undercut.

Actually, a good many so-called block caves today are not block caves in the true sense of the word. However, the problems of supporting the transfer drifts and draw points and

the undercutting and breaking of the material are not materially different than in true block caving.

New Hazards Introduced

Anything new creates unforeseen problems. Supervisors and men must learn the safe use of new equipment and everyone connected with a new operation must learn by experience the new hazards that have been introduced.

Falling material continues to be the number one hazard in spite of the fact that workmen need no longer be exposed to unsupported stope openings or development drifts. The support of transfer drifts and drilling drifts, if used, constitutes a major problem and the danger of material falling from the draw points is a major one.

Other hazards which are now recognized include:

Handling of long strings of heavy drill rods.

Blasting in one transfer drift while working in an adjacent drift.

Charging and blasting long holes.

The possible failure of pneumatic columns.

The ever-present danger of slusher ropes, blocks, etc.

This paper will attempt to describe several methods for overcoming these hazards.

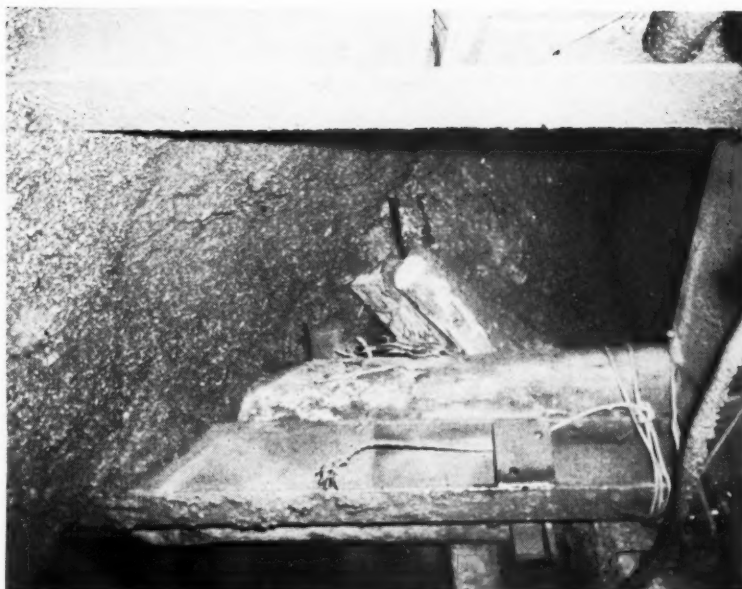
Proper Type of Support

The number and length of the transfer drifts depend on the size and shape of the ore body and the system used. The generally accepted distance between transfer drifts is from 20 to 25 ft, with the distance between draw points 15 to 18 ft, depending on the spacing of the supports. The total height of the block to be drawn and the consistency of the ore, affect, to a great degree, the length of time that the transfer drifts must remain open and in use. This in turn assists the operator in deciding upon the type of support to be used in the transfer drifts. Where blocks are 50 to 60 ft in height and the material completely drilled and broken by primary blasting, conventional hardwood timber sets usually suffice if special attention is given to the timbering at the draw points. A fairly satisfactory solution to the constant damage to breaker caps is to encase them in extra-heavy pipe 10 to 12 in. in diameter. These last much longer than unprotected wood and greatly reduce the number of times that the caps have to be replaced.

Steel Sets

If the block is to be much higher than 50 ft and if the major portion of it is to be actually caved after the blasting of the undercut, conventional wood timber will probably prove unsatisfactory. The next step for a moderately high block, where moderately heavy conditions are anticipated, is to use rigid circular steel sets six to seven ft in diameter. A five-in. H-section at 18.5 lb per ft has proved quite satisfactory, with the spacing dependent on the judgment of the operator, usually four ft or less. Where real heavy conditions and comparatively long life are anticipated, a very satisfactory solution can be found with the use of yieldable circular steel sets. In our experience to date, these supports are the best that can be obtained.

With either the rigid or yieldable sets, it is prudent to continue the use of large, heavy timber at the draw points, since these supports



A fairly satisfactory solution to the constant damage to breaker caps was to encase them in extra-heavy pipe 10 to 12 in. in diameter.

will ultimately have to be replaced, regardless of what is used.

Maintenance Highly Important

The proper care and maintenance of steel sets, rigid or yieldable, are of the utmost importance. The accepted method of maintaining rigid sets is almost diametrically opposite to the method used with the yieldable sets. In the former, weight relief to prevent distortion can be obtained only by removing and then replacing the back and side poles, lagging and blocking. This must be done as soon as signs of excessive weight appear or the rigid sets will be destroyed.

With the use of yieldable steel sets, either arches or complete circles, an almost opposite technique is employed. The openings between the sets should be tightly and uniformly poled and blocked, after which relief from excessive weight is obtained by the yieldable feature. Care should be taken to keep the "U" bolts uniformly tight and to remove any obstructions which might tend to prevent the joints from yielding. If this maintenance work is faithfully performed, the yieldable supports are almost indestructible. We have a number of cases where the joints have moved to the point that the inside members were actually touching each other, with the set becoming stronger as yielding continues.

What has all this to do with safety? The greatest hazards are encountered in drawing the ore from the mills and repairing supports which have failed. If the use of

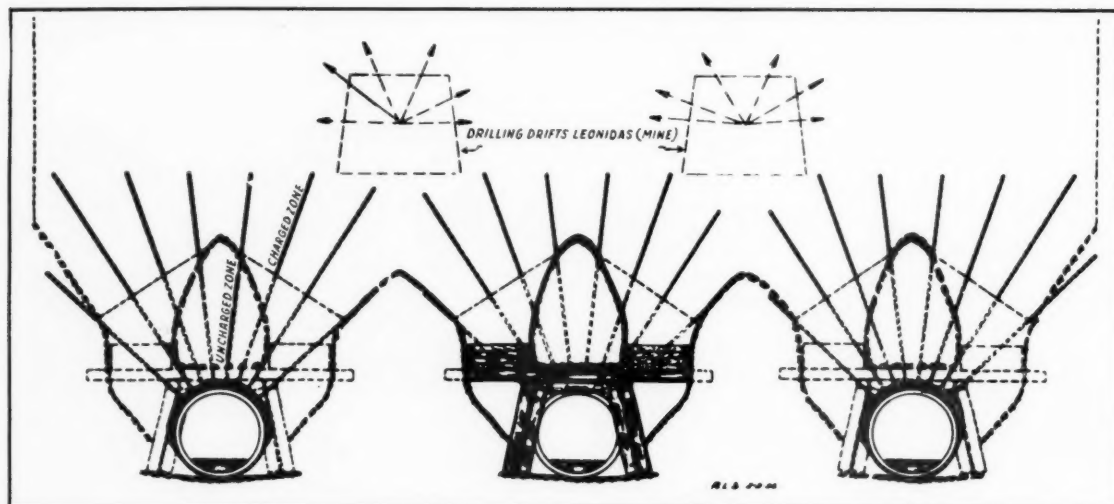
good judgment and proper support results in decreasing the number of major replacements, much of the hazard of this type of mining is automatically eliminated.

Mills and Draw Points

Hang-ups in the mills will never be entirely eliminated. Secondary long hole drilling and blasting and bombing are constantly necessary. Great care must be exercised during either of these operations to eliminate the possibility of a blast in one transfer drift propagating to another or knocking down large chunks into open draw points. The basic rule—"Everybody out when blasting"—should be enforced.

Whenever possible, transfer scraper drifts should have connections at both ends for entrance and exit. The importance of having two ways in and out is obvious, but cannot be overstressed. Other advantages include: improved ventilation and the ability to work on both ends of a repair job simultaneously.

Keeping draw points properly blocked off and loaded with broken material is one of the major supervisory headaches of the system. Many devices have been tried and the average workman objects, to most of them. It is of the utmost importance, through some means or other, to keep all idle draw points securely blocked off, with a minimum of 10 to 15 ft of broken material protecting the blocking. This is one of the major safety enforcement problems. Draw points opposite each other are preferred to staggered draw points.



Typical section through block cave type stope at the North Range Mining Co.

Drilling Problems

Long hole drilling with sectional steel has greatly improved the preparation of the undercut, or the radial drilling and blasting of the entire block, if such proves expedient. However, the use of long strings of one in. or larger, drill rods presents a number of hazards which must be constantly guarded against. We know of one make of drill machine that is specifically designed to handle these long strings of rods in steep up-holes. This machine has a specially designed steel centralizer which safely holds the balance of the string in the hole while additional sections are being added or removed. If the drills in use do not have this type of steel centralizer, other safe methods of holding the steel securely in the hole must be used.

Efficiency in moving the drilling equipment indicates the use of two pneumatic posts, or columns, with a horizontal bar supported between them. If the valves on these columns are not equipped with some type of safety device, a rather serious hazard exists. Some method must be used to guard against the possibility of the valve handle being accidentally moved, since the result of a column accidentally falling while the drill machine is in operation can be very serious. A simple circular steel guard can easily be welded to the post to protect the valve handle.

Charging and Blasting Holes

Missed holes or undetonated cartridges are a recognized hazard. Great care must be taken in charging the long holes; first, to be sure that all of the powder-charge stays in the hole, and secondly, to be sure that all of the powder is detonated. Primacord throughout the entire length of

the hole, along with one or two electrical detonators, has proved very satisfactory. Also, some type of expanding plug or other tamping should be used to keep loose cartridges from falling down and exploding close to the timber.

Scraper Ropes and Blocks

Quite frequently, it is expedient and desirable to continue long hole drilling from the transfer or scraper drifts while slushing or scraping is being carried on. A simple "roll-up" safety screen made of light rods and chain completely eliminates the hazard of breaking scraper ropes and blocks as far as the drillers are concerned. These should be so constructed as to be easily rolled up and out of the way when not in use. This haz-

ard, of course, is greatly reduced if drilling drifts above the transfer subs are used.

Summary

The major points could be summarized as follows:

Danger from Falling Material. Keep draw points well blocked and partly full of ore when not in use. Do not pull from opposite mills at the same time if it can be avoided. Block one and pull from the other. If a whole group of mills is pulled empty, block off the entire drift, since a heavy fall may flatten the entire area.

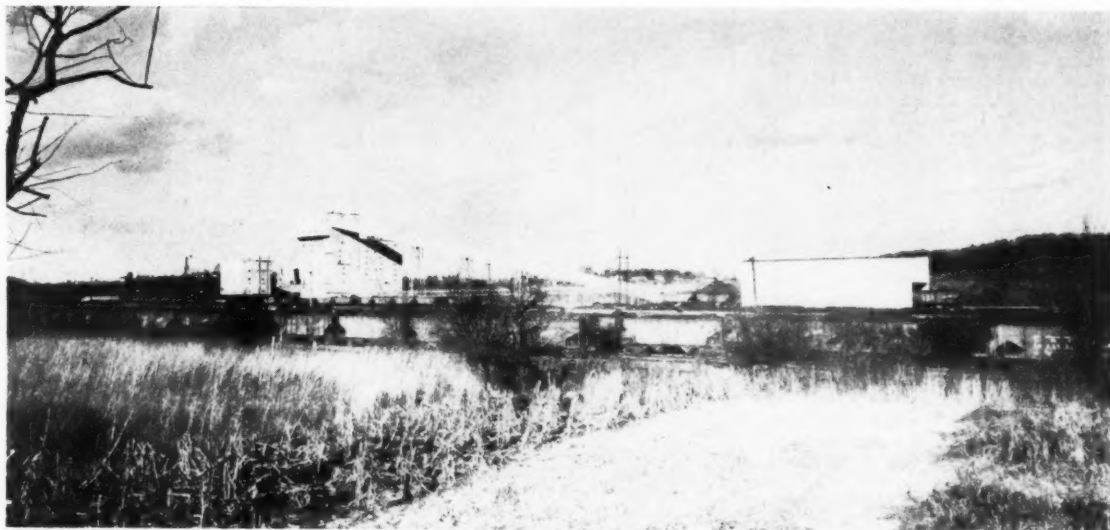
Long Hole Drilling. Safe handling of long strings of steel is very important. If the drill machine is not designed properly, other steps must

(Continued on page 133)



If proper maintenance work is performed, the yieldable supports are almost indestructible. In this case the joints have moved to the point where the inside members are almost touching each other. The set will become stronger as yielding continues

The Corbin, Ky., Cleaning Plant



The cleaning plant was located 90 miles away from the coal mines to take advantage of terrain, water supply, refuse disposal area, and access to railroad facilities

Heavy-Media for coarse coal and tables for fine coal form the heart of this large new coal washer

By PAUL L. RICHARDS and ANDREW E. HAMLET

Respectively, Manager—Coal Preparation, Coal Division; and Superintendent, Corbin Cleaning Plant, U.S. Steel Corp.

ADVANCES in modern steelmaking have resulted in increasing demands for better quality raw materials.

One of these basic raw materials is coal. An acceptable metallurgical grade of coal, low in ash and sulphur is required. When mining was in inherently clean coal seams, a marketable product was obtained by selective hand loading. But increased use of mechanical equipment has lessened the degree of selectivity attainable in mining, with a consequent increase in ash content of the raw product. Coal beneficiation has thus become necessary.

United States Steel Corp. operates two coal mines at Lynch, Harlan County, Ky., which produce some 17,000 tons of bituminous coking coal a day. It is used as the high volatile portion of the coal blended for use in by-product coking ovens at the corporation's Northern Lake Front Plants.

Location of a washing plant at Lynch was not possible because of the terrain and other factors. A site was selected near the outskirts of Corbin, Ky., some 90 miles west of Lynch. It meets all requirements from

the standpoint of general terrain, water supply, refuse disposal and access to railroad facilities.

Before designing the new plant careful studies were made of various preparation processes, the primary consideration being the ultimate coke quality. Full seam samples selected from widely separated areas were subjected to washability, coking, and petrographic tests to determine how the coal should be washed and to adapt the plant to the available raw coal reserves. Further data were obtained by actual tests at the coke plants and blast furnaces, and through coking tests conducted by United States Steel's Research and Technology Division.

During the initial design phase the Market Development Division of United States Steel arranged a series of meetings between the contractors, designing engineers, Coal Division engineers and operating personnel, with United States Steel's various producing divisions to determine the grades of steel most suitable for economy and maximum performance in the construction of the plant. This procedure in general was also followed in

the specifications to the equipment manufacturers.

With plant design completed the initial ground-breaking took place in August 1954. The first coal was processed in October 1955. All facilities were in operation by December 1955.

During the construction phase 680,000 cu yd of earth were moved; 8550 cu yd of concrete poured; and 2147 tons of structural steel erected. The size and intricate operation of the plant is evidenced by the 165 motors totaling 5490 hp, ranging in size from $\frac{1}{4}$ to 350 hp. All the major steel items were fabricated and erected by the American Bridge Division of United States Steel.

Raw Coal Handling

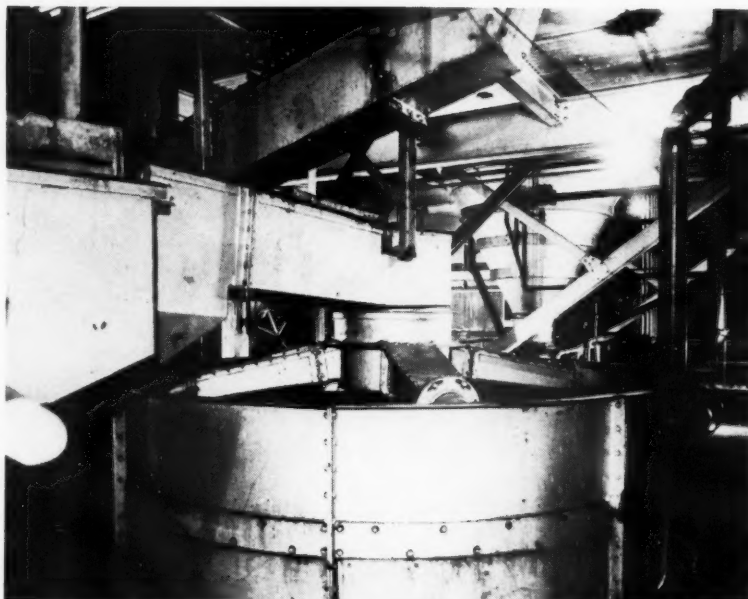
Run-of-mine coal is first crushed at Lynch to 8 in. by 0. It is then loaded into hopper railroad cars for shipment to the Corbin Cleaning Plant. The cars are identified by seam origin—High Splint, B and C seams. At Corbin the railroad places the classified coal by seams on the track set aside for each seam. A diesel switch

engine moves the loaded cars to the unloading station and places the classified coal over the proper bin for unloading. Car doors are opened manually and cars are unloaded by shake-out units. Four bins are presently in use, each with 600 tons storage capacity. Concrete for two additional bins was poured with the initial structure. A bin for sand is also located at the unloading station. The switch engine moves the unloaded cars either to the loading station or over a by-pass track to the lower yard.

Dual vibrating feeders at the bottom of each bin remove the 8-in. by 0 coal from the bins at the proper rate to maintain a specified blend from the several coal seams. Rate of flow from the various bins is controlled by a flow meter type of belt weighing scale on each of four 42-in. conveyor belts which carry the coal from the vibrator feeders to the raw coal belt. For control purposes, equipment to obtain raw coal samples is installed at this point.

The raw coal belt, designed for future capacity of 1200 tph, carries the coal under an electromagnet to remove foreign metal and then to a 30 by 72-in. single roll crusher where the blended ROM coal is reduced to a maximum size of four in.

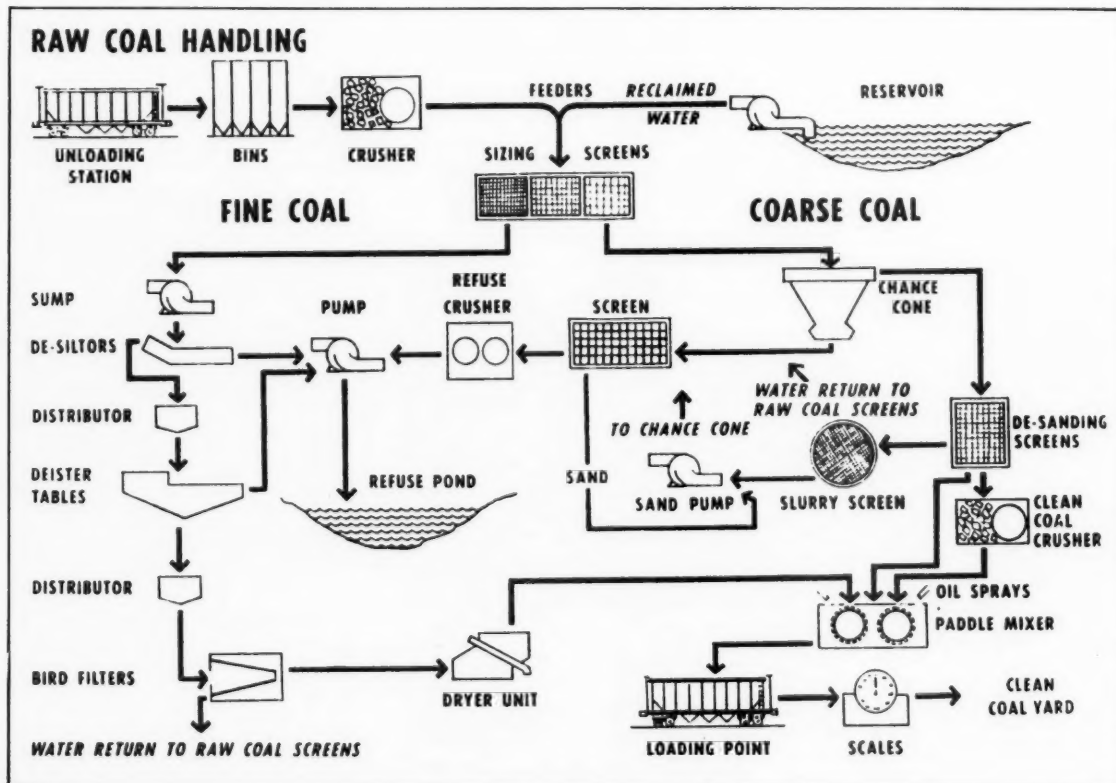
Coal proceeds by a 54-in. plant feed conveyor belt to a 60-in. shuttle belt



This radial desilting screen is the first such installation in the United States. It permits continuous desilting of the fine coal product from the Chance cone.

over four 50-ton capacity surge bins located on the top floor of the plant. During periods when the raw coal feed is stopped, the plant feed belt is used to bring in sand used in the cleaning process. Level indicators,

with remote indicating devices at the plant's control panel, show the coal level in the bins. The raw coal bin storage capacity permits a constant feed rate to the raw coal screens and reduces operating delays when the



Flow sheet of the Corbin cleaning plant.

main coal belt is used to replenish the sand supply.

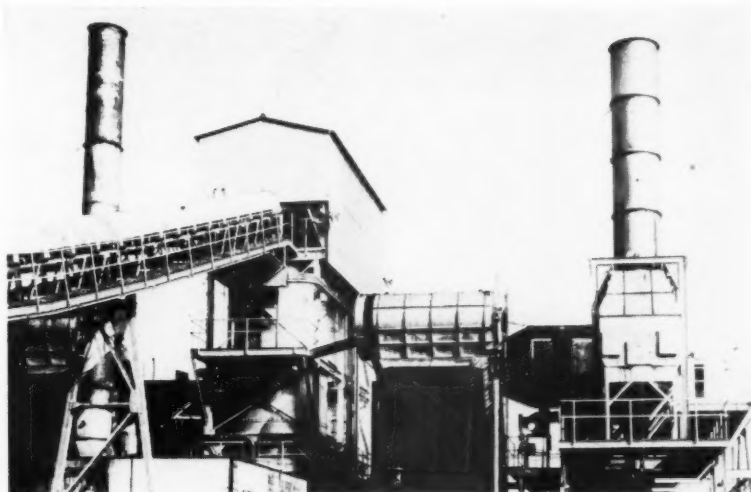
Coarse Coal Processing

Coal from the storage bins is removed by four vibrating feeders at a designed rate of 600 tph of ROM coal and is distributed to four 5 by 14-ft. primary raw coal screens for separation into 4 by $\frac{1}{4}$ -in. and $\frac{1}{2}$ -in. by 0 sizes for cleaning. The top deck is equipped with woven wire with $\frac{3}{4}$ -in. openings. The bottom deck is equipped with woven stainless steel wire having $\frac{3}{16}$ -in. openings. All raw coal handling bins and chute liners handling dry raw coal are equipped with abrasion resistant type AR steel. Those handling wet coal are of stainless steel which also resists corrosion.

Approximately 2400 gpm of clarified water is added to the launders to sluice the ROM coal from the feeders to the primary vibrating screens for separation into the 4 by $\frac{1}{4}$ -in. and $\frac{1}{2}$ -in. by 0 sizes. The minus $\frac{1}{4}$ -in. through product, in the amount of 180 tph, flows by gravity to the fine coal sump tank. The 4 by $\frac{1}{4}$ -in. product, in the amount of 420 tph, is collected by a 42-in. belt conveyor and transferred to a 16 ft. 6-in. diameter Chance sand cone.

The Chance Sand Cone Process uses the dense media principle in the separation of coal from refuse. Raw coal, sand and water are continually added to the cone and the resultant mixture is slowly rotated within the vessel. The sand and water in suspension form a dense medium of such a specific gravity as to allow the coal to float. Refuse settles to the bottom of the cone where it is trapped off through a refuse chamber. The refuse flows over a 5 by 16-ft. vibrating screen equipped with a punch-plate top deck with perforations of 1- $\frac{1}{2}$ in. in diameter and a stainless steel 1 $\frac{1}{4}$ -mm wedge wire bottom deck. The under-size or through product flows by gravity to the refuse sand sump. From this sump the overflow goes to refuse and the underflow returns to the main sand sump in the chance cone circuit. The 4-in. by 1 $\frac{1}{4}$ -mm material falls by gravity to a double roll crusher set at 2- $\frac{1}{2}$ in., and from the crusher to the main refuse sump. Refuse from the fine coal plant is also collected in the same sump. Total plant reject is about 60 tph, or ten percent. The 2 $\frac{1}{2}$ -in. by 0 reject material, with approximately 3000 gallons of water per minute, is pumped by an eight-in. centrifugal pump through 400 ft of eight-in. dredge-line pipe to the refuse pond.

The float or clean coal from the cone passes on to three 5 by 16-ft low-head vibrating screens for desanding and dewatering. The top deck is equipped with spring steel with three sections of one-in. openings and one section of 1 $\frac{1}{2}$ -in. open-



For safety purposes the heat dryers were installed in a separate building.

ings. The bottom is equipped with stainless steel wire with $\frac{3}{16}$ -in. openings. Dewatered 4 by 1 $\frac{1}{2}$ -in. coal is carried by a 42-in. belt conveyor to a ring-type crusher where it is crushed to pass 1 $\frac{1}{2}$ -in. and then by a 42-in. belt conveyor to the loading point. The 1 $\frac{1}{2}$ by $\frac{1}{4}$ -in. clean coal can either be loaded direct to the clean coal belt or by-passed to the heat dryers, if necessary, for additional moisture removal.

One important feature in this system is the successful application of continuous desilting. Slurry from the desanding screen, containing the silt, flows by gravity to a radial screen. In the flume to the radial screen a stainless steel wedge-wire section takes off some water and sand, with the remainder continuing on to the radial screen. The flow of the material through four revolving arms assures even distribution of the slurry to the screen. The slurry flows by gravity across the wedge-wire screens,

being washed continuously with fresh spray water. The oversize, or silt, flows by gravity to the silt sump, while the undersize, or mixture of sand and water, is pumped back to the sand circuit in the Chance cone system. The radial screen is of German design and this is the first such installation in the United States.

Fine Coal Circuit

Fine coal screened through the battery of raw coal screens, plus the silt removed from the coarse coal circuit, are collected in a fine coal sump from which the combined material is pumped to a splitter box and divided between two bowl desilters.

These units comprise a flat bottom thickener tank, 40 ft in diameter, with four arm-revolving rakes on which plows are mounted at the proper angle to move settled solids from the center of the bowl out toward the periphery. A segment of the



Minus $\frac{1}{4}$ -in. coal is cleaned on two batteries of nine tables each.

circular tank bottom is cut out above a standard quadruplex rake classifier. The tank side is cut out above the segment between the side plates of the rake classifier. The bottom plate line of the tank, which cuts off the modified segment of the circular tank bottom, is a curve which distributes the raked solids evenly to the four rakes. Feed solids are discharged through a four-way splitter into the rake compartment a little outside of the projected circle of the bowl tank side wall. The coarse solids settle in the rake compartment, while the balance, including slime, flows back into the bowl. Here additional settling takes place with slime classified to the overflow of the bowl.

The overflow solids or slimes are all minus 100 mesh, approximately 80 per cent of which is minus 200 mesh. In addition to this relatively sharp classification, the desilter adds another valuable operating feature in

in cleaning fine coal, but also materially improves the efficiency in mechanical dewatering by solid bowl centrifugal filters, giving an over-all performance ranking with the best in the industry.

Clean coal from the centrifugal filters, plus the desired quantity of $1\frac{1}{4}$ by $\frac{1}{4}$ in. coarse coal, is carried by a system of conveyors to two surge bins located in the thermal dryer section. For safety considerations, the thermal dryers are removed from the main preparation plant building and are of open-type construction. The surge bins are equipped with circular plate feeders so that a uniform feed can be maintained.

The thermal dryer section is broken down into two units. Both units are equipped with furnace, pulverizer and dust collectors. One unit has two dryers while the other has one. From the surge bins the wet coal is fed by a screw conveyor

belt. It is conveyed to the shipping station where it is first sampled automatically and then oil sprayed for bulk density control. The coarse and fine coals then move through a paddle mixer. From the paddle mixer the coal moves by gravity to the coal loading chutes and into railroad cars. By a system of pneumatic car retarders the cars are dropped to the scales, weighed and placed in the clean coal yard for shipment to destination.

Coal Quality Control

Sampling procedures are designed to control both product quality and plant efficiency. Routine and special samples are taken to the plant laboratory for analysis by a full-time technical staff. Coke quality is periodically determined by U. S. Steel's Applied Research Laboratory.

Plant Performance

The raw coal from the B, C and High Splint seams averages 9.5 percent ash. However, daily increment samples show variations from 5 to 30 percent in ash content. With low ash and uniformity of product of prime importance in blast furnace performance, the plant product has met the guaranteed average analysis of 3.5 percent ash. It has also met uniformity specifications requiring that at least 67 percent of the samples in any one month shall be within a range of plus or minus five percent of the guaranteed average value.

With the bowl-desilter removing in excess of 90 percent of the minus 200-mesh slimes from the table feed, the centrifugal solid bowl filters have been able to maintain a surface moisture in the cake of 6.5 percent. Since the designed plant capacity was based on the capacity of the thermal dryers, this performance has permitted an increase of 25 percent in the plant feed. In addition, the shipped product analyzes 4.0 percent total moisture instead of the guaranteed average value of 4.5 percent. With a raw coal averaging in excess of 9.0 percent ash, the plant has consistently maintained a yield of approximately 90 percent.



On the right is the gallery which houses the 54-in. raw coal belt. In the foreground can be seen the pipe gallery which carries refuse to the pond in the background.

that the rakes discharge at an unusually uniform rate. This uniformity not only permits a maximum feed rate but provides a dewatered rake product for tabling. The deslimed rake products from each desilter is mixed with fresh water and flows by gravity to a nine-way distributor that feeds equal quantities of fine coal to each of the wet concentrating tables. The overflow to the desilter and the table refuse flow by gravity to the coarse refuse pump sump.

From the two batteries of nine tables, the clean coal flows by gravity to a five, four-way distributor so that any desired combination of four solid bowl centrifugal filters are in normal operation. The system contains five filters of which only four are in use at any one time.

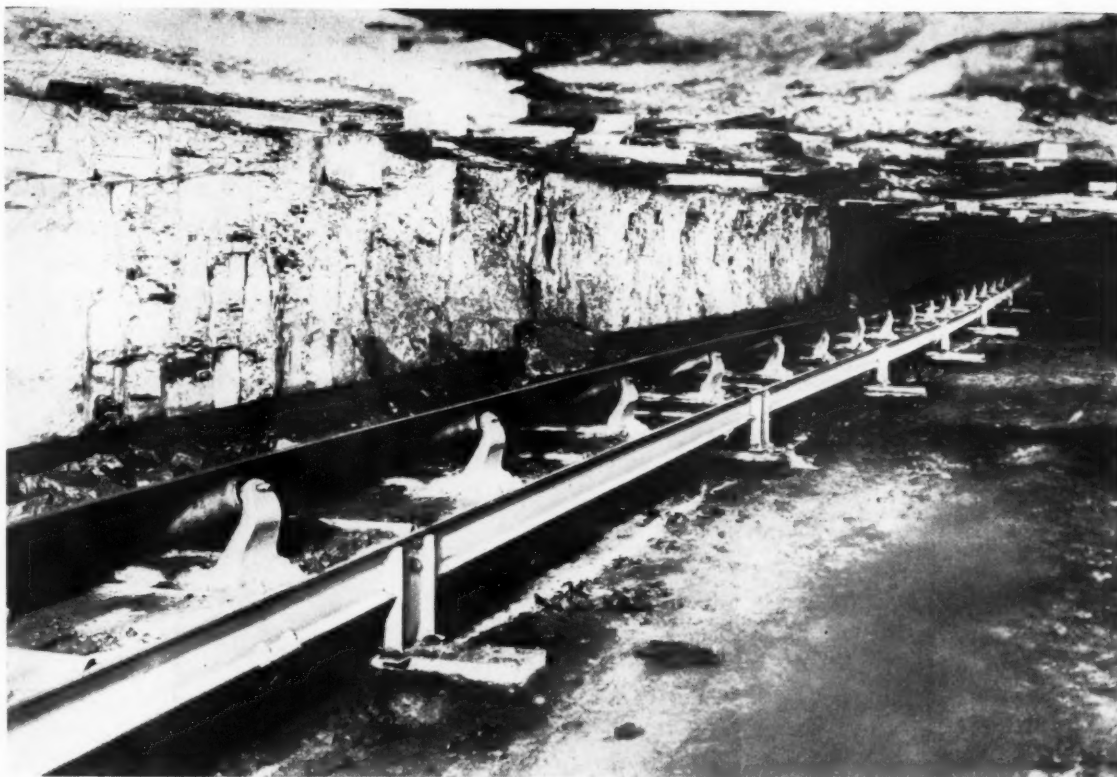
The fifth filter is maintained as a spare. The effluent from the centrifugal filter is returned to the clarified water circuit. The uniform deslimed feed not only promotes high efficiency

into a multi-louvre thermal dryer. The coal as discharged from the dryer unit contains approximately three percent moisture. Any attempts to further reduce the moisture creates a material handling problem. Fine coal particles entrained in exit gases from the dryer are trapped first by a primary multi-cone dust collector and returned either to the dryer furnace feed bin when needed for dryer fuel or to the product. The exit gases are then scrubbed in secondary wet Rotoclones. The scrubbing gases are removed to the atmosphere, while the fly ash is removed in the spigot product and pumped to the main refuse sump for disposal. An integral feature of the thermal drying section is the use of objectionable dusty fines as dryer fuel.

Clean Coal Handling

Dried coal is returned to the main preparation plant by a belt conveyor and added to the coarse clean coal





An adequate protective system, careful installation and good housekeeping are all needed to assure proper fire protection.

Belt Fire Protection

Three authors attack problem of belt fire protection from different angles. Subjects covered include basic processes of fire resistant conveyor belt construction, electrical protective devices that lessen fire hazards of belts, proper installation and operation, and maintenance and inspection of belt conveyors

Fire Resistant Conveyor Belting Construction

By J. L. THORNTON

Manager Coal Division
Belting Sales Department
The Goodyear Tire & Rubber Co.

ONE of the "burning" questions before mining circles today is that of fire resistant conveyor belting. Since the coal mine group is the largest single user of belting in this country, the subject is pretty hot with belt manufacturers, too. Many operators are deeply concerned with the various aspects of this subject. It is not

feasible to cover all of them in this paper, so it has been elected to discuss some of the basic processes of construction, their methods and problems, as well as the relationship of these factors to belt costs and field service.

A fire resistant belt is one which meets the requirements of the U. S.

Bureau of Mines Schedule No. 28 approved November 9, 1955. In standard rubber belting, of course, both the rubber and the fabric are flammable. Fire resistant belting still uses flammable fabric, but it is so thoroughly impregnated with fire resistant materials that it can not support combustion.

Fire Resistant Materials

There are two main types of fire resistant belting being considered today. The first is a Neoprene construction which is well established in this country and has proven its ability to render good service in the field. Neoprene compounds process in a very similar manner to those of rubber and present no special manufacturing

problem. Neoprene is capable of physical properties similar to those of rubber although it must be judged by somewhat different standards from those normally used for rubber. The proper balance of properties is more important than any single property. For example, Neoprene can be compounded to have a very high tensile strength, but this requires a sacrifice of other desirable properties, of factory processability and ultimately of cost.

The second type of fire resistant belting is that made with PVC or polyvinyl chloride. This type of belt is being used in large quantities in England at the insistence of the Government. Their choice of PVC was based on several factors such as the dollar shortage, and the availability of English manufactured PVC. Processing methods and equipment used in the manufacture of PVC belting are completely different from those in rubber and Neoprene.

PVC has good abrasion characteristics but has a lower co-efficient of friction. This lower co-efficient of friction makes higher operating tensions necessary to prevent slippage.

How Conveyor Belts are Made

It may be of interest to discuss briefly the methods of belt manufacture. "How are rubber and Neoprene belts made?" The first step is the mixing of the compounds using materials which have been previously tested. The rubber or Neoprene is thoroughly mixed with various pigments, softeners, and cure materials in mixers called banburys. These machines mix a batch of 300 to 400 lb of rubber in a matter of minutes. The completed batches are individually tested to rigid standards and are only released for use in belts upon conformance to specification.

Fabric used in the manufacture of belts is carefully inspected and run through a cell dryer prior to impregnating it with rubber. The rubber is applied to the fabric on machines called calenders where, by means of odd speed rolls the rubber is wiped down into the interstices of the fabric. Another method of applying the thin coat to the fabric is by spreading.

Following this process, a layer or coat of rubber compound is pressed on top of already rubber-impregnated fabric. The material is then cut to width and is ready for assembly on building tables.

The cover gum is also calendered or sheeted out to the required gauge and width, then taken to the building tables.

Curing is accomplished in large presses operating at high pressures and temperatures for specified periods of time. It is done in sections according to the length of the press.

Curing is accomplished in large presses operating at high pressures and temperatures for specified periods of time. It is done in sections according to the length of the press. The section is then moved forward and a new piece of uncured belting is brought into the press.

The next question to be answered is "How are PVC belts made?" The method most generally used in England is called the plastisol method. A plastisol is a doughlike mixture of PVC resin, plasticizer, stabilizer, and pigments blended in a churnlike mixer. This material is spread on to

contributors to the cost of the belt is the fabric. In comparing the above belt constructions, fabric costs should be very close together.

The second large item in cost is that of the compound. Polymer costs are much higher for PVC and Neoprene than for rubber and GRS. Since they are both also very high in gravity, the volume cost is even more widely separated from rubber. They, however, do more nearly approach each other on this basis.

In compounding, Neoprene and PVC generally use higher priced materials than rubber. There is room for con-



Proper alignment is important. Belts should not be allowed to come into unnecessary contact with the conveyor structure or with objects along the conveyor.

the fabric, heated to flux the resin and plasticizer into a non-tacky material. Several spread passes are required to attain the proper gauge. The fabric plies must be heated to a very high temperature, brought together under pressure, and cooled under pressure to form the belt. This requires very special equipment. Edges are usually added as a separate operation.

Manufacturing Costs Compared

Any attempt to generalize on comparative final costs can be very misleading and deceptive, but some of the basic factors which govern cost in these various constructions can be considered.

The first and one of the largest

siderable latitude in the selection of materials for Neoprene. However, there is very little chance to lower costs in PVC. Total material cost, therefore, is higher for PVC than for Neoprene, although both are considerably above rubber.

In processing and building belts, rubber and Neoprene are very much alike. PVC requires special equipment, however, which is not available in the greater majority of belt manufacturing plants. Even with equipment available, the process is expensive and wasteful and the belt is not a serious contender in the drive for a low cost fire resistant belt.

Fire resistance is a very desirable characteristic in underground belting. It has now become a necessity in some places. It is unfortunately a property which has a price tag attached.

Electrical Protective Devices for Belt Conveyors

By J. H. NASH

Electrical Engineer
Ensign Electric & Mfg. Co.

BELT conveyors are very commonplace in the present day coal mine as a system or means of economically and continuously transporting coal to the surface. In many mines, the belt conveyor is one link of a complete haulage system.

In an automatic belt conveyor haulage system a large percentage of the equipment is operated unattended so that a small failure, mechanical or electrical, can very quickly start a fire or cause serious belt damage, unless the conveyors are protected by adequate automatic protective devices.

Controlled Sequence Starting

One of the first problems encountered when more than one conveyor is used, is that of the outby or outside belt not running and the inby conveyor discharging coal on it, causing a pile up. This can be prevented by belt sequence.

Some belt conveyor motor starters are sequenced by feeding control power from the outby starter to the inby belt by means of remote control cables running the length of the belt conveyor. A very effective alternate method is the use of a centrifugal switch placed at the tail section of the outby conveyor. The centrifugal switch has a normally open contact that will remain open until the outby conveyor is running at a pre-determined speed. This contact being connected in series with the push button of the inside belt will prevent it from operating until the outby belt is operating up to speed.

Belt Slippage Protection

The second problem is that of belt protection, or a device that will shut down the belt in case the drive pulley is slipping and has caused the belt to slow down. This condition can be caused from overloading of the belt, the belt fouled mechanically in some manner or caught on an idler pulley that would cause the drive pulley to slip and result in a fire.

Belt protection can be accomplished to a very effective point by the use of a centrifugal switch placed under the belt it is desired to protect. This switch has a normally open contact in series with the stop button on the belt conveyor under which it is placed.

The switch contact is set to close just below the running speed of the belt. This must have a normally closed contact shunted across it when the belt is at rest so that the control circuit is completed during the starting period. Once the belt is up to speed the normally closed or starting contact must be opened by some means. The centrifugal switch contact having closed, is now capable of maintaining the control circuit until the belt slows down allowing the centrifugal to open, shutting down the belt conveyor.

The normally closed or starting contact on a belt protection set-up can be opened when the belt is up to speed by several methods:

- (a) It can be opened manually, which is inconvenient and not reliable.
- (b) A timing relay can be used with a normally closed contact, the

timing relay coil being energized as the "start" button is pushed. When the centrifugal contact is up to speed and closed, the normally closed timing contact will open giving belt protection.

- (c) The normally closed or starting contact can be provided on the final accelerating contactor of the motor starter. The contact being connected in parallel with the centrifugal contact, but in series with the main line contactor coil behind the accelerating contactors. When the belt comes up to speed the centrifugal switch contact closes. The normally open contact on the final accelerator will open when the starter has completed its timing period allowing the belt to operate in a protected condition. Should the centrifugal contact open from belt slippage, the line contactor will open, stopping the belt. The starter will not automatically restart or pump because the normally closed or starting contact was connected behind the accelerating contactor and they will remain closed, holding the starting contact open until the "stop" button is pushed deenergizing the complete control circuit. When the "start" button is pressed the control



Maintenance and inspection of belt conveyors will lead to a reduction in the fire hazard.

will accelerate to operating speed, if the fouled or slippage condition has been corrected.

Safety Control Along Belt

Another major problem is that of being able to start or stop the conveyor at any point along its length. This is quite necessary when men are transported on the belts or the belts are used for fire bossing the mines. The belt may be shut down at any point along its entire length by the use of safety control. This consists of two bare wires supported along the entire length of the belt which may be touched together at any point by a man on or off the belt.

The wires have three v dc, supplied by two dry cell batteries in the belt control enclosure. These wires are connected to a sensitive relay which has a set of normally open contacts connected in series with the operating coil on a ratchet relay. Alternately touching the wires together causes the ratchet relay to first be in the open and closed position. The relay

contacts are connected in series with the belt conveyor motor starter control circuit, starting and stopping the belt conveyor along its entire length. A timing relay is included to prevent jogging of the belt. This time interval can be set from $\frac{1}{2}$ to 2 min.

The safety belt control is available for suspension of three wires along its length for use with magnetic reversing starters. When the belt is not in the "stop" position, the third wire can be touched to one of the other wires, alternately selecting forward and reverse contactors. Then the belt can be restarted by touching the original two wires together starting the belt up again. This set-up is a very convenient and effective means for fire bossing a mine in low coal seams.

When belt conveyors are equipped with full magnetic motor starters, sequencing centrifugal switches, centrifugal switches and timers for belt protection and safety belt control, they become a very effective and safe means of transporting coal.

important that friction be kept at a minimum.

Free Prevention

Fire prevention is very important and should be given every reasonable consideration. However, protection against fire should not be devaluated or overlooked entirely. Even when all reasonable fire-prevention precautions have been taken, it is still possible to have a conveyor-belt fire. Therefore, the availability of fire-fighting equipment, its adaptability to the type of fire, and readiness for use can spell the difference between a misfortune and a disaster.

A brief discussion of means for fire prevention and fire protection follows.

Fire-resistant conveyor belts, properly installed and maintained, will greatly reduce the probability of fire and limit the extent should a fire occur. As accepted belts have been tested with top and bottom covers intact, it should be remembered that a belt with large sections of either or both covers removed by abrasions or tearing is not in its anticipated fire-resistant condition. Such sections should be repaired or replaced promptly. In this regard it should be noted that these conveyor belts should be repaired only with fire-resistant materials.

When drive or other pulleys are lagged, the lagging should be constructed of a fire-resistant compound. Flexible idlers (rollers) and impact rollers, other than metal, should be of fire-resistant construction.

It should be mandatory to provide each conveyor belt not listed as fire-resistant with an automatic "slippage control" in operating condition. However, consideration should be given to providing all conveyor belts, even those listed as fire-resistant, with such protection. Bureau tests have proved beyond doubt that a drive pulley rotating against a stationary belt can ruin any belt, set flammable belts on fire, and cause dangerous accumulations of heat in the area.

One of the most prolific sources of conveyor-belt fires in the United States is electrical. Many electrically caused belt fires could have been prevented if proper precautions were taken during the installation, operation, and maintenance of conveyors. Power circuits should be adequately protected by current-interrupting devices, such as circuit breakers and fuses of correct type and capacity. Powerlines should be large enough to carry the normal load with enough reserve to accommodate reasonable overloads, and the powerlines should be on insulators and kept free from contact with combustibles. The insulation on wires and cables carrying electrical energy should be of fire-resistant compounds.

Prevention of Underground Conveyor-Belt Fires

By S. P. POLACK

Health and Safety Engineer
U. S. Bureau of Mines

WE of the Bureau of Mines are convinced that most belt fires or other mine fires are preventable.

The coal industry enjoys a distinction seldom encountered in other fields. We have an extensive opportunity to exchange ideas and to profit from each other's fortunes and misfortunes. Strict adherence to and compliance with the rules and regulations of the individual States where belt conveyors are installed; the Federal Mine Safety Code and the Mine Safety Provisions of the Federal Coal Mine Safety Act; rules and regulations adopted by individual operating companies and industry-wide organizations of the operators and mine workers; reports published by American Mining Congress committees; advice and instructions provided by each manufacturer for the safe and efficient installation, operation, and maintenance of equipment and a careful study of papers presented at meetings such as the AMC Coal Conventions do much to reduce fire hazards.

In the final analysis the cooperation of all units of the industry—management, supervision, labor, and inspection—coupled with the efforts of man-

ufacturers to furnish the safest and most economical equipment ever devised for coal-mine use, will bring greater safety and productivity.

Fire-Resistant Belts

A project recently completed by the Bureau of Mines in cooperation with State mining departments, rubber manufacturers, mine workers, and mine operators' associations resulted in the implementation of Bureau of Mines Schedule 28, Fire-Resistant Conveyor Belts. The schedule provides for testing conveyor belts and for listing them as fire-resistant after they have met the outlined requirements. The belts are appropriately branded for recognition. When this manuscript was prepared, 65 conveyor belts submitted by ten manufacturers had been listed. However, it must be noted that the belts so listed are fire-resistant, not fire-proof. When ignited, all such belts will burn as long as the source of ignition is active and flame is applied. In some instances enough heat can be accumulated in a conveyor belt to ignite combustible materials coming into contact with the belt. It is therefore

Cleanliness is the basic principle of good housekeeping. Accumulations of coal, lumps, fines, dusts, and other combustibles in the vicinity of belt conveyors should be avoided. Conveyor structures and transfer points should be constructed of incombustible or at least fire-resistant materials. Care should be taken to avoid excessive spillage of lubricants. Spills should be cleaned up frequently. Consideration should be given to the use of higher flash-point and higher combustion-point greases and lubricants. Studies now under way may lead to the development of greater fire resistance in lubricants. Sticking rollers often result from untidiness, and rollers that fail to turn are heated by friction of the moving belt, causing lubricants to drip and thus increase the fire hazard.

The second most prevalent source of belt fires is friction. Heat created by friction must be avoided. Belts should not be allowed to come into unnecessary contact with the conveyor structure or with objects along the conveyor. Proper alignment is important and can be attained by using care during installation of conveyors and judicious use of vertical (training) idlers.

A communication system that furnishes contact among all main points along a conveyor system and other parts of the mine is imperative. Good communication is both fire prevention and fire protection.

Regular inspection deters belt fires and fires in general. The inspection should be thorough and objective. All deficiencies disclosed should be corrected promptly.

Fire Protection

When a fire does occur, in spite of all preventive precautions, the speed with which it is combatted can save lives and greatly reduce property damage.



Proper installation pays off in greater safety and better operation

Bureau of Mines Information Circular 7662, Fire-Fighting Equipment in Coal Mines—Selection, Placement, and Care, offers guidance to make fire protection effective.

Accessibility

Every possible precaution should be taken to provide a reasonably clear and unobstructed path for travel along conveyors and at critical locations, so that when the need arises fire fighting can proceed without undue hindrance.

An alternate avenue of escape should be maintained in areas where belt fires are possible. The route should be in an atmosphere that will not be contaminated by the fire. The escapeways should be reasonably accessible, plainly marked, and familiar to everyone in the area.

It is advisable to have enough self-rescuers for emergency use; they should be examined periodically, and personnel should be instructed in their proper use.

The quantity and velocity of air used to ventilate belt-conveyor instal-

lations have been discussed frequently with a variety of conclusions. Too much ventilation will no doubt accelerate a fire and cause fine coal to disperse. Too little will allow concentrations of noxious and explosive gases and in turn hinder fire-fighting.

Research has shown that objectionable gases are given off when belting, fire-resistant or not, is heated to any appreciable extent. Although this should not be considered a cause for undue alarm, enough air—at least the legal minimum—should be provided to dilute and render harmless any impurities in the atmosphere. For greater safety and to assist fire-fighting, conveyors should preferably be ventilated by separate splits of air leading directly into the return.

In conclusion, it appears evident that the proper installation, operation, maintenance, and inspection of belt conveyors and their appurtenances will lead to a reduction in the fire hazard. This should bring about a greater degree of safety to and increase the productivity of those who extract the coal, the basic mineral of our prosperous economy.



Belt conveyor fires have given rise to new ideas.



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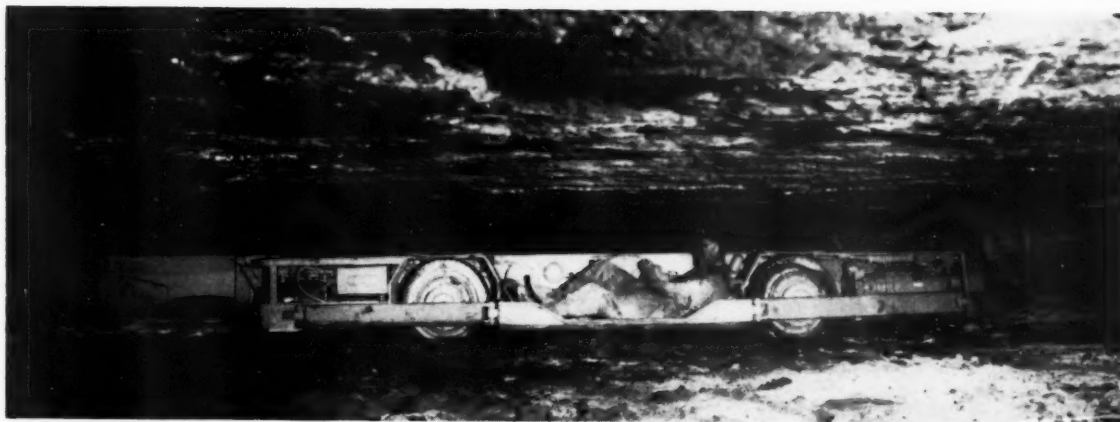
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By adding 50 ft to the length of a No. 4 trailing cable the voltage drop increases three v. at rated current

Voltage Drop in Trailing Cables

AMC Committee on underground power outlines the factors controlling the efficiency of face equipment

By JOHN DUNN
and
C. O. WOOD

VOLTAGE drop in d-c mining machine trailing cables is a very important factor in today's modern high capacity mining. As machines become larger and mining rates are increased, it is only natural that these trailing cables must conduct more electric power. Also, in an effort to gain efficiency in mining methods, often long trailing cables are used.

It is common practice in mines to make load and voltage surveys up to the trailing cable taps. This does not give the true picture of voltage conditions at the motor terminals and yet this is where machine performance begins. Quite often when the voltage at the trailing cable nip is 220 or 230 v., it is considered that the voltage conditions are good. The fact that the voltage drop in the trailing cable might be 20 or 30 v. and the motor is more than likely operating on 80 percent or less of design volts is overlooked.

Normally, it is considered good practice if voltage at motor terminals can be maintained at plus or minus 10 percent of rating. In practice it is difficult to maintain these conditions, and since a slight overvoltage would have less ill effects than undervoltage, it would seem best in general to try and maintain a 10 percent minus and about 15 percent plus spread. Some mining machine motors

in the past have been designed for 250 v. and some were designed for 210 v. Present NEMA standards for industrial d-c motors is 230 v. In the near future we will see the NEMA standard changed to 240 v.

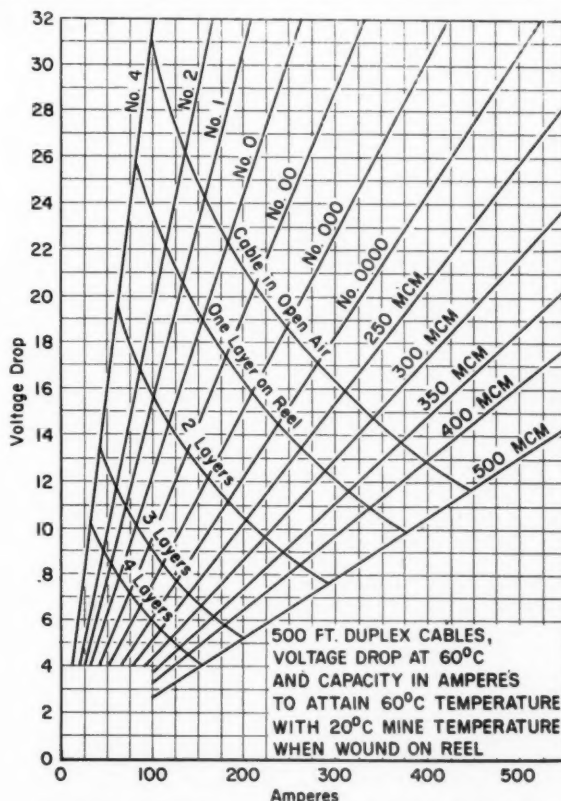


Fig. L—Effect of layers of cable on cable reel in decreasing nominal current rating

TABLE NO. 1

	No. 4	No. 2	No. 1	No. 1/0	No. 2/0	No. 4/0	MCM 350
CABLE RATING AMPERES 60°C COPPER 20°C AMBIENT	98	134	155	183	212	282	331
TWIN CABLE LENGTH	VOLTAGE DROP AT RATED CURRENT						
250 FT	15.5	13.1	12.0	11.2	10.4	8.6	6.1
300 FT	18.7	15.7	14.4	13.5	12.4	10.4	7.3
350 FT	21.8	18.3	16.8	15.7	14.5	12.1	8.6
400 FT	24.9	20.9	19.2	17.9	16.5	13.8	9.9
450 FT	28.0	23.6	21.6	20.2	18.6	15.5	11.0
500 FT	31.0	26.2	24.0	22.4	20.6	17.3	12.3
550 FT	34.0	28.8	26.4	24.7	22.7	19.0	13.5

Voltage drop in flat twin mining cables,
sizes No. 4 through 350 MCM, at rated
current

since this will better match control and conversion equipment. The 240-v. standard seems best and for this discussion we will consider that mining machine motors are rated 240 v. This means that a low of 240 minus 10 percent, or 216 v., should be maintained at machine motor terminals and a high of 240 plus 15 percent, or 276 v., should be maintained at light load on the conversion substation bus.

Need for Constant Voltage

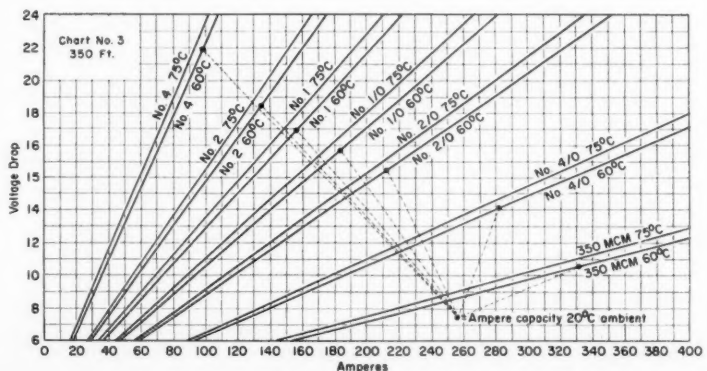
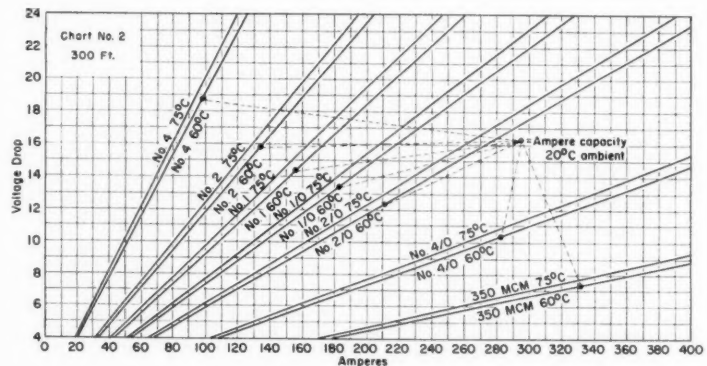
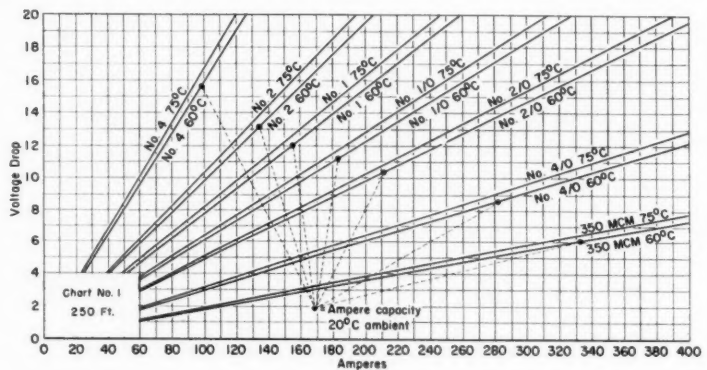
There has been quite a bit of information published on the effect of voltage on a d-c motor. It would be worthwhile to refer to an article published in *Mining Congress Journal* in March and May of 1955, entitled, "Mining Machine Motor Identification." In general if the output torque of a d-c motor remains constant, then the speed will vary directly with the voltage. From a production standpoint alone, low voltage at the motor terminals means less coal processed or produced. There are other factors also that increase production cost when voltage is low, such as higher maintenance of motors and controls, and higher maintenance cost on machine cables.

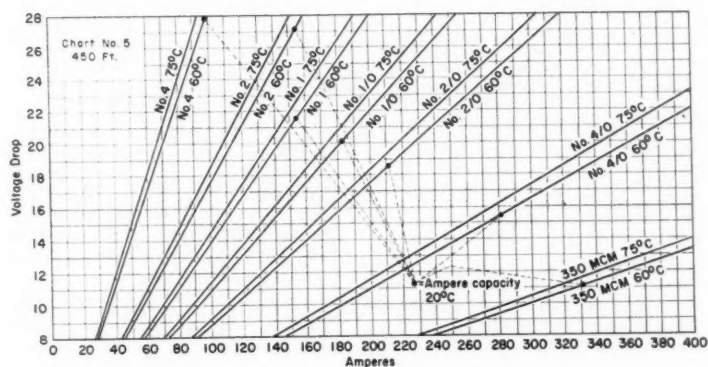
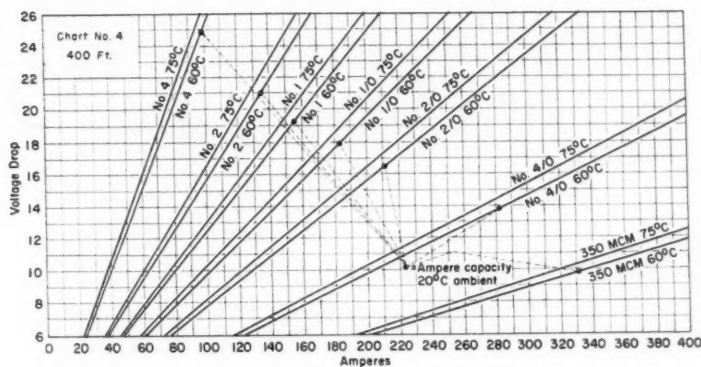
It would be useless to attempt to say just how much voltage drop could be allowed in trailing cables unless the conversion substation location is considered. That is, just how close is it located to the mining area and what size feeders are maintained. Table No. 1 shows the voltage drop in flat twin mining machine cable sizes 4 through 350 MCM at rated current. This table includes cable lengths of from 250 ft up to and including 550 ft in 50-ft steps. The

current rating is the number of amperes that produce a 60°C copper temperature in a 20°C ambient atmosphere, the general ambient temperature found in coal mines.

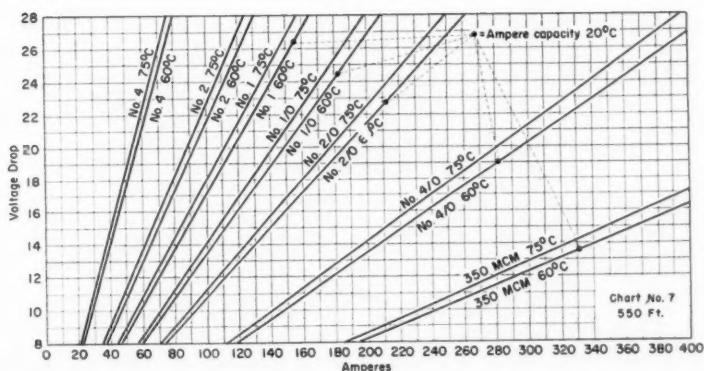
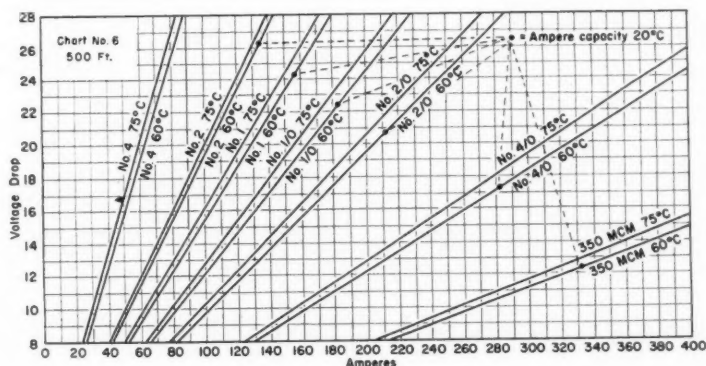
Factors Affecting Voltage Drop

Voltage Drop Charts 1 through 7 show the voltage drop in these same cables up to 28 v. or 400 amp. These charts include curves for 60° and 75°C copper temperature. Copper temperature affects the voltage drop in a piece of cable and also affects the useful life of the cable. Where cables are layer wound on cable reels or piled along the entry, the free circulation of air along cable is restricted and they may operate at much higher tem-





Charts 1 through 7 show the voltage drop at rated current for seven cable sizes at 60°C and 75°C copper temperatures in cables from 250 to 550 ft in length



peratures. Figure 1 shows the effect of various numbers of layers of cable on cable reel in decreasing the nominal cable rating.

From Chart No. 1, which is for a 250-ft length of trailing cable, it can be seen that if the current in the cable is near the cable rating the voltage drop will run from 15.6 v. for No. 4 down to 6.1 v. for 350 MCM. If we go to Chart No. 7, which is for 550-ft lengths, we can see that, at cable rating, the voltage drop is above 28 v. for No. 4 and No. 2 and goes down to 13.5 v. for 350 MCM. From this it can be seen that the length of trailing cable has a serious effect on the voltage drop.

Often trailing cables are applied to mining machines on a load factor base and the peak operating current of the machine is well above the 60°C rating of the cable. It is under these conditions, or where cable lengths are above 350 ft, that the voltage drop in the cables present an unusual problem. It is common to see loading machines operating at from 175 to 300 amp and cutting machines at from 200 to 400 amp. Under these conditions it can be seen that if the trailing cables are long, or if they are small, the voltage drop is exceedingly high and machine operation is seriously affected and may even reach stall conditions.

Ways of Correction

Generally speaking, a 275-v. mine feeder system is considered well designed if the voltage drop in it is no greater than 40 v. If this is the case, only 19 or 20 v. is all that remains for drop in the trailing cable if 90 percent of voltage is maintained at the motor terminals. From an inspection of cable lengths and equipment loading, it is simple to refer to the voltage drop charts and obtain cable drop. Likewise if a voltmeter is used at the cable nip and loading is determined by use of an ammeter it is simple to determine the voltage at motor terminals when cable size and lengths are known. It is highly important to know that the mine feeder system is capable of operating without excessive voltage drop.

If voltage drop at the motor terminals is excessive, it would be well to consider increasing the size of trailing cable, reducing their lengths, moving conversion substations closer to face or a combination of all these steps. It would be beneficial to make up a list of mining equipment in use with cable sizes and lengths and with normal operating amperes. From the charts, voltage drop can be determined and listed. By analyzing this list it may be found that the voltage drops in present cables are excessive and that by some adjustments a reasonable solution can be found.

Exploration, Development and Mining Cost on the Plateau

Little has been written recently on the economics of uranium mining. Here a consulting engineer tells why the Government should set a true and realistic value on uranium or at least establish an exploration allowance and increase the amount of development now being paid under Circular 5

By JOHN I. SCHUMACHER, I. R. TAYLOR and
H. C. ANDERSON

John I. Schumacher & Associates
Mining Engineers

THE following charts and graphs on exploration, development and mining cost are presented here in an effort to give a true and clear picture of the uranium mining industry. A considerable amount of thought has gone into the compilation of this data and a great amount of time has gone into the collection of these figures from various government agencies, individuals that are recognized as leaders in the industry, mining companies and drilling companies. The average figures of mining cost as used is taken from a survey which we feel represents a true cross-section of the uranium industry on the Colorado Plateau. It includes large companies with high production, small independent companies and mining companies that are in the mining as well as milling business. The figures as used on exploration costs represent estimates from companies that either have had long experience in uranium exploration or from persons that have been long associated in some respects with the industry. These figures do not represent companies with purely speculative values and a relatively small proportion of wild cat drilling is included. They include both Morrison and Chinle-Shinarump deposits.

Some estimates and assumptions have been made that are based on experience of the authors or others, but in each case, conservative figures are used.

Because of the lack of available information and the changing type of exploration being carried on, none of the attached figures apply to the Grants, New Mexico area. Although it appears that large ore bodies are being found, exploration costs are still quite variable and even though it is expected that they will be lower than on the Colorado Plateau, these reductions in exploration cost might be off-set by higher over-all mining

cost. There are many problems at present in mining ore from the West Water formation.

Drilling Costs

Drilling prices have increased in some categories (see Table I) such as core drilling which requires a high percentage of labor. In most cases however, as in non-core rotary drilling and wagon drilling, prices have decreased due to improved techniques and equipment. It is estimated that in 1951, 60 percent of the drilling was done by core drilling, while in 1955 only 10 percent was core drilling. Formerly, entire holes were cored but now with better geologic control only the ore-bearing sand is cored and the upper part of the hole is drilled by percussion wagon drilling or by rotary non-core drilling.

Total costs in Table II are an aver-

age of contract drilling prices plus other costs of geologic mapping, assaying, sampling, probing and other indirect cost chargeable to drilling. Costs per ton of ore is the product of the total cost multiplied by feet per ton of ore.

Effect of Depth

The graph in Fig. 1 shows that the average drilling depth has varied from below 50 ft in 1948 to 240 ft in 1955. The years beyond 1955 have been projected and show that in 1960 the average depths of drilling are expected to be 380 ft. The graph is based on Government contracts, private exploration and development drilling.

From Fig. 2 it can be readily seen that the cost of exploration rises rapidly as the depth of ore increases. The average depth of drilling in 1955

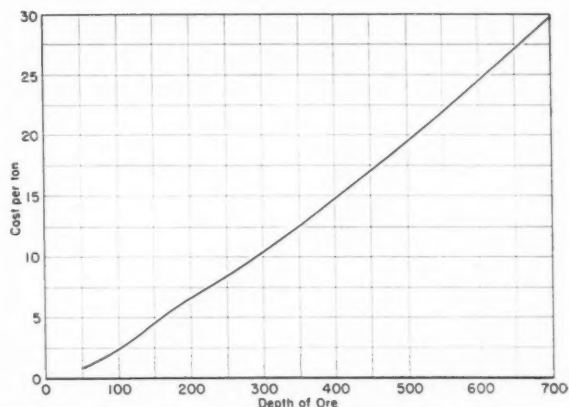
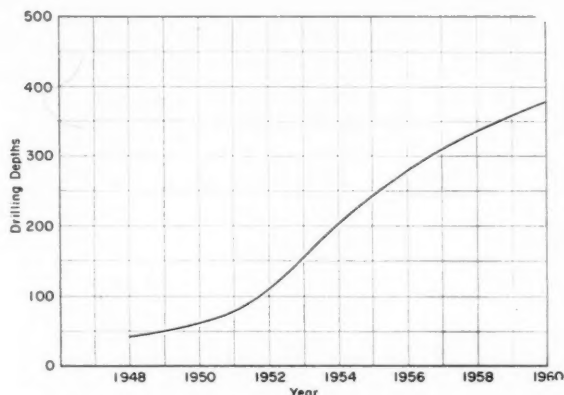
TABLE I—DRILLING COST AVERAGES 1951-1955

Ft	Core		Non-Core Rotary		Percussion Wagon Drilling	
	1951	1955	1951	1955	1951	1955
0-200	\$1.87	\$2.62	\$1.25	\$1.32	\$9.95*	\$8.5
200-400	2.78	3.00	1.50	1.55		
400-600	3.87	4.50	2.00	1.87		
600-800		6.00		2.50		

* Practically no wagon drilling done to depths of 200 ft in 1951. Price 0-100 ft averaged \$0.754.

TABLE II—AVERAGE FT PER TON AND COST PER TON OF EXPLORATION 1951-1960

Year	Average Depth	Ft/Ton Ore	Total Cost	Cost Per Ton Ore
1951	75	1.25	\$1.69	\$2.11
1952	110	1.83	1.80	3.29
1953	160	2.67	2.03	5.42
1954	205	3.42	1.88	6.43
1955	240	4.00	2.05	8.20
1957	310	5.17	2.15	11.12
1960	380	6.33	2.20	13.92



(Left to right) Fig. 1—Average depth of drill hole, 1948-1960. Fig. 2—Exploration costs in dollars per ton at varying depth, 1955

was 240 ft. The graph shows that cost of exploration per ton at this depth is approximately \$8.20. If drilling depths increase at their present rate, by 1960 the average depth will be 380 ft and cost per ton of exploration will be \$13.92. Continuing with this rate of increase, it shows that soon exploration cost will exceed over half the value of an average ton of ore.

Fig. 5 indicates that a 2000-ton deposit becomes unprofitable at depths of 90 ft, 10,000-ton deposit becomes unprofitable at about 240 ft, etc., up to 100,000 tons which become unprofitable at approximately 460 ft. The figures from which this graph were prepared is based on an average grade of ore of 0.28 percent U_3O_8 and 1.5 percent V_2O_5 or approximately the average grade of ore being mined on the Colorado Plateau today. Mining cost varies somewhat with this size of deposit and development and ex-

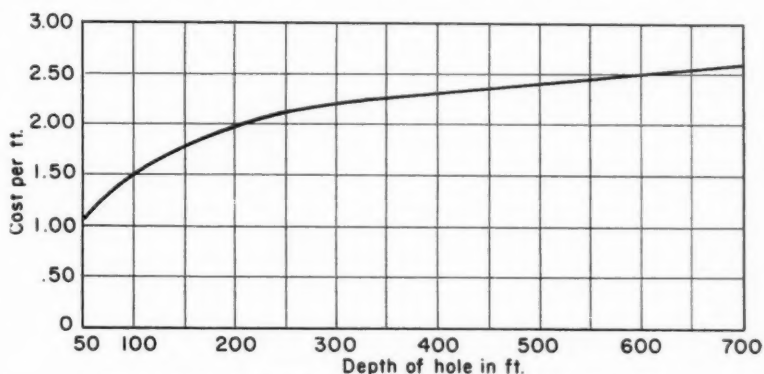


Fig. 3—Exploration cost per foot of hole for varying depths, 1955

ploration costs increase with depth. An allowance of 15 percent has been used as an acquisition cost or royalty of the property. No allowance has been made for taxes, or interest on capital investment and no considera-

tion has been made of the risk involved. The graph indicates that the average size mining operation on the Colorado Plateau is operating at a loss and only the properties which have the advantage of Government



A survey of mining companies operating in 1951 and also in 1955 showed an increase of 51.6 percent in the average exploration, development, and mining cost

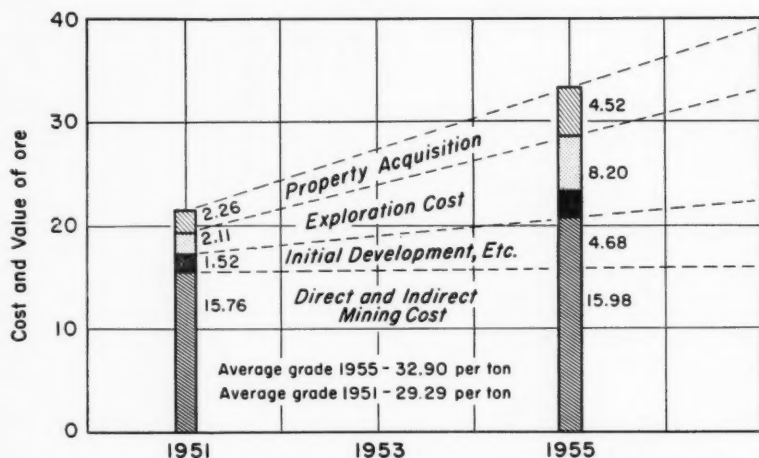


Fig. 4—Total cost in dollars per ton for period 1951-55 (based on 10,000-ton ore body)

drilling, low purchase cost or lie at relatively shallow depths can operate at a profit under the present price structure.

Cost of Exploration Has Increased 289 Percent

It is estimated that the average grade of ore mined in 1951 was 0.23 U₃O₈ and 1.70 V₂O₅ and had a value of \$29.39 including development bonus. The average grade of ore mined in 1955 had a value of \$32.90 including development bonus.

Using averages from the graph on exploration cost per ton on ore found, it will be noted that the cost of exploration has increased from \$2.11 per

ton in 1951 to a cost of \$8.20 per ton in 1955 or an increase of 289 percent. This increase is due mainly to increased depths of drilling. Primarily due to increased average depths of ore discovered in 1955, the average cost of initial development has in-

and development cost at greater mining depths. In over-all averages, however, of present mines, the increase in labor, equipment and supplies is offset by improved mining methods and equipment by the mining of larger ore bodies.

Several Trends Noted

From the foregoing graphs and charts, it is evident that several trends have developed in the uranium mining industry and it appears that the small producer without substantial reserves will be out of the business after mining his present ore. It also shows that medium and large sized companies under the present price structures set by the Atomic Energy Commission in 1951, will be faced with ever increasing exploration cost and development cost that will make uranium exploration and mining an unprofitable venture or at least a poor risk in comparison to other types of mining. The mill capacity planned for completion in 1956 will be 12 times the mill capacity of 1950. It is doubtful that new ore finds will be made at a rate that will keep mills at maximum capacity for more

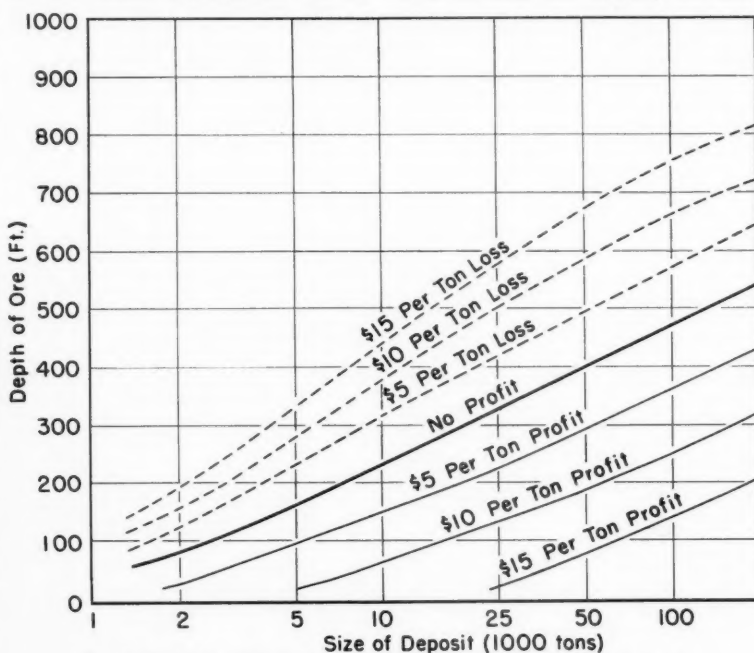


Fig. 5—Probable profit or loss for varying size targets at varying depths



Prospecting. It is doubtful that new ore finds will be made at a rate that will keep mills at maximum capacity for more than three years.

creased 308 percent. This figure also takes into consideration increased cost of surface plant equipment.

The average mining, exploration and development cost from a survey made of mining companies operating in 1951 which also operated in 1955 shows an increase of 51.6 percent. Of this an estimated 18.6 percent is due to increased cost of labor, equipment and supplies and the remaining 33 percent is due to increased exploration

than three years. Should this trend continue it would not be too many years until the United States will be a "fifth rate" nation as far as domestic reserves are concerned. It is imperative to the best interest of the country that the Government set a true and realistic value on uranium or at least establish an exploration allowance and increase the amount of development now being paid under Circular 5.



Ninety-eight percent of the industrial diamonds imported into this country are mined in Africa, chiefly in the Belgian Congo

The Diamond and Sheet-Mica Industries

Salvage, substitution and synthesis destined to play increasingly important roles

**By W. F. DIETRICH, W. H. WAGGAMAN and
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LACK of adequate domestic deposits of several minerals and dwindling reserves of certain high-grade ores have created challenging technical and economic problems that are taxing the ingenuity and skill of our mining, metallurgical, and chemical engineers.

Industrial diamonds and sheet mica are two outstanding non-metallic minerals that cannot be produced from

domestic sources in sufficient quantities to meet the requirements of the United States; moreover, the major diamond deposits are in Africa, and the bulk of the high-quality sheet mica is produced in India and Brazil, where mining and distribution of these minerals are beyond our control.

Even under normal conditions the need for these two minerals is such that imports must be maintained

relatively high, and in case of war the demand would increase enormously.

Assuring Adequate Supplies

With a view to insuring this nation adequate supplies in an emergency, both industrial diamonds and the higher qualities of sheet mica are being stockpiled; but, in spite of the concerted efforts of industry and several Government agencies, the stockpile objectives have not been met. Consequently, intensive studies are being made of other means whereby the shortages of these strategic minerals may be alleviated. The three logical methods of stretching the limited supplies are salvage, substitution, and synthesis.

- (1) Salvage in a broad sense, includes utilization of low-grade materials and recovery of desired end products from discards formerly regarded as waste.
- (2) Substitution comprises the use of other materials or processes and redesign of equipment to perform (in part at least) the functions of the product it is desired to replace.
- (3) Synthesis may be defined as the building up of the de-

sired end product from its elements or other compounds by chemical and physical methods.

Consumers of diamonds and sheet mica are employing all of these means and their potentialities are being further investigated. Although there appears to be no immediate prospect that such alternatives can replace these two minerals in certain strategic applications they have already provided considerable relief.

Similarities

Whereas the properties of industrial diamonds and sheet mica are entirely different and their industrial uses are in sharp contrast, the following factors applicable to both these mineral industries render it practicable to consider them in the same category.

- (1) Both must be imported from distant sources.
- (2) The industrial value of both minerals depends on certain inherent physical properties which cannot be enhanced by chemical and metallurgical means.
- (3) Compared with most other non-metallic minerals, industrial diamonds and sheet mica are produced in minor quantities at high cost.

TABLE 1.—UNITED STATES CONSUMPTION AND APPROXIMATE VALUE OF CERTAIN INDUSTRIAL MINERALS¹ IN 1953

Mineral	Consumption (short tons)	Value ² (dollars)	Average price per short ton ²
Industrial diamonds	2.5	\$ 40,370,000	\$ 16,148,000.00
Sheet mica	6,867	15,231,580	2,218.00
Graphite	34,821	3,482,100	100.00
Feldspar	513,521	4,654,950	9.06
Fluorspar	586,798	29,046,500	49.50
Asbestos (raw)	743,625	64,018,720	86.09
Potash salts	3,130,891	48,716,760	15.56
Sulfur ³	5,655,328	126,235,000	22.34
Gypsum (crude) ⁴	11,477,168	31,217,897	2.72
Phosphate rock	11,824,697	64,681,090	5.47
Salt	20,789,000	78,277,000	3.76
Sand and gravel	139,506,000	141,342,000	1.01

¹ Source of data, Minerals Facts and Problems: Bureau of Mines Bull. 556, 1956.

² Because of the wide variation in the grades of some of the industrial minerals, the average values in some instances are only approximate.

³ From all sources.

⁴ Domestic production and imports.

- (4) The economic importance of the services that these minerals render appears out of all proportion to the small quantities annually consumed.

The consumption and approximate value of industrial diamonds, sheet mica and a number of other essential non-metallic minerals in 1953 are stated in Table 1. These materials are listed in the order of their consumption, and the figures not only serve to show the great variation in the rate of consumption, but the wide

difference in the unit price of other minerals compared with mica and industrial diamonds.

As a concrete example—the consumption of feldspar in 1953 was 513,521 short tons or over 200,000 times greater than that of industrial diamonds and nearly 75 times greater than sheet mica, yet the value of this quantity of feldspar was only 11½ percent of that of the industrial diamonds and 30½ percent of the sheet mica consumed.

Industrial Diamonds

THE term "industrial diamonds" is generally used to denote offcolor, fragmented, and imperfect stones that are unsuitable for gems. Their usefulness depends on their hardness, toughness, and resistance to elevated temperatures and corrosive chemicals. Their most valuable property, however, is hardness which cannot be matched by any other natural or manufactured product.

World production of industrial diamonds in 1954 amounted to 16,800,000 carats, of which 16,611,000 carats or more than 98 percent were mined in Africa (chiefly in The Belgian Congo). South America produced a little more than one percent.

The annual imports of such diamonds into the United States for the period 1929-1954 are shown in Table 2. These imports reached an all time high in 1954 and reflect the increasing importance of industrial diamonds in our national economy.

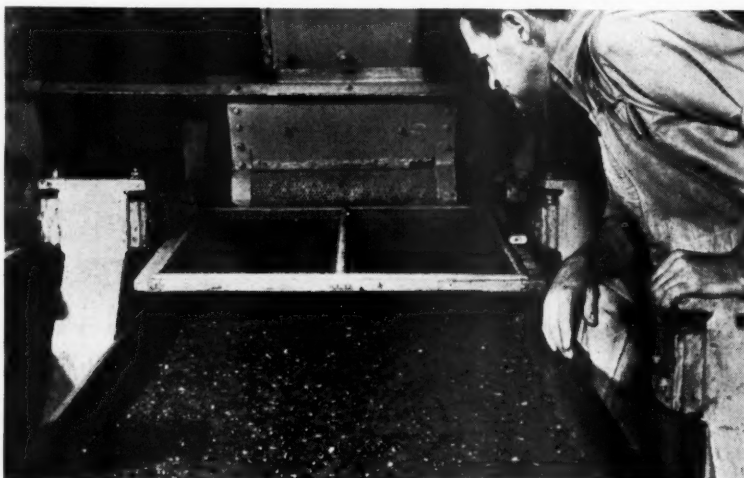
The diamond industry is largely dominated by one large organization that controls distribution and prices. Under such conditions it is desirable, if not essential, to take all practicable steps to conserve the limited supply

of industrial diamonds allotted to the United States.

Uses

The hardness and durability of diamonds render them of vast importance to the mining industry and in

the manufacture of innumerable finished products. Diamond drill bits make it possible to prospect deep-seated mineral deposits that otherwise could not be economically explored; shaped diamond tools are used for boring, trimming, and grooving non-ferrous metals, plastics, and ceramic products to the close tolerances that precision instruments require. When



Recovery of industrial diamonds. After washery and screening out the bulk of barren material, the concentrate is flushed over long inclined tables covered with grease to which the diamonds adhere.



This tailings dump, 110 ft high, is the discard from mining and processing diamond bearing material. Only about one part of diamond by weight is recovered from 35,000,000 parts of gangue.

properly used, such diamond tools outperform and outlast those made from any other material. Diamond dies are employed in drawing thousands of miles of fine wire annually without appreciable wear.

By far the greatest proportion of industrial diamonds is used in grinding and abrasive wheels. For this purpose a thin layer of small fragments or sized diamond powder is applied to the surface of the wheel and rigidly held by a resinoid, metal, or vitreous bond. Diamond wheels are used for finishing and polishing

many products but are chiefly employed in sharpening cemented carbide tools. These tools, in turn, are employed for cutting, machining, and finishing various metal products.

The estimated consumption of industrial diamonds in 1953, according to end uses, is given in Table 3.

Recovery Economical

Since diamond fragments, no matter how small, retain much of their value, it is often economical to recover them from waste products containing only minor quantities.

Diamond-bearing materials susceptible to salvage include worn diamond-pointed tools, old drill bits and diamond dies, broken and discarded diamond abrasive wheels, and the swarf and sludge resulting from machining and grinding with diamond wheels.

The reclaiming of relatively large diamonds or diamond fragments from drill bits and other diamond tools is a relatively simple matter, but the salvaging of fine sizes of diamond powder contaminated with high percentages of various impurities requires both ingenuity and skill.

In dressing metal and ceramic products and in sharpening machine tools, the diamonds imbedded in the abrasive wheels gradually wear down, become detached from the bond, and are discharged in the form of waste. This waste product, which is termed swarf or sludge (depending on whether it is dry or wet), consists of a finely divided mixture of metal, carbides, bonding materials, and other impurities, along with minor quantities of diamond fragments.

Since 1951, when a shortage of industrial diamonds appeared imminent, much attention has been given to the salvage of diamond powder from swarf and sludge. This is accomplished by both physical and chemical means, but chiefly by treating the waste material with acid and various fluxes that render the metallic constituents and other impurities soluble but leave the diamonds unattacked. The salvaged diamond powder is then washed, screened, and reused.

The cost of recovering diamonds from swarf and sludge depends on the nature and quantities of the impurities contained therein, but where care is taken in segregating diamond-bearing waste from that produced in grinding with other types of abrasive wheels the salvage of diamond powder has proved quite profitable. At least eight concerns are now recovering diamonds from various types of discarded materials.

Table 4 shows the quantities of crushing bort and diamond powder salvaged during 1950-52 and the estimated recovery in 1953.

TABLE 2.—IMPORTS OF INDUSTRIAL DIAMONDS INTO THE UNITED STATES¹—(Metric carats)

1929	46,901	1942	11,203,704
1930	145,862	1943	12,084,133
1931	224,970	1944	12,614,507
1932	163,704	1945	10,729,869
1933	263,484	1946	4,625,282
1934	526,007	1947	3,999,119
1935	954,589	1948	10,421,207
1936	1,166,094	1949	6,279,096
1937	1,885,670	1950	11,039,036
1938	1,396,247	1951	12,120,647
1939	3,568,730	1952	13,452,819
1940	3,809,071	1953	12,765,495
1941	6,882,248	1954	13,807,204

¹ Source of data, Mineral Facts and Problems: Bureau of Mines Bull. 556, 1956.

TABLE 3.—ESTIMATED CONSUMPTION OF INDUSTRIAL DIAMONDS IN 1953, ACCORDING TO END USES¹

Type of diamonds and end use	Quantities (carats)	Percent of total
Bort and powder, mostly for grinding wheels	9,000,000	81.82
Stones for diamond drilling	1,300,000	11.82
Stones for grinding wheel dressers	600,000	5.46
Stones for shaped tools, etc.	50,000	0.45
Stones for wire drawing dies	50,000	0.45
Total	11,000,000	100.00

¹ Source of data, Mineral Facts and Problems: Bureau of Mines Bull. 556, 1956.

TABLE 4.—QUANTITIES OF CRUSHING BORT AND DIAMOND POWDER SALVAGED ANNUALLY IN THE PERIOD 1950-53¹

Year	Quantity (carats)
1950	685,000
1951	800,000
1952	950,000
1953	1,000,000 ²

¹ Source—Miscellaneous Minerals, Metals and Minor Metals Division, NPA.

² Estimated figure.

The estimated recovery of diamonds from wastes in 1953 was approximately 9 percent of the total consumption. Whereas this estimate is only approximate, the potentialities

of diamond salvage have not been fully realized, and the present recovery is probably considerably lower than that which can be economically affected.

Nearly 82 percent of the diamonds used for industrial purposes are incorporated in abrasive wheels, and the swarf and sludge derived from grinding operations contain the bulk of the diamond waste. By exercising greater care in using diamond wheels and in collecting the resultant swarf and sludge, it is conceivable that the percentage of diamonds salvaged may be raised to as high as 20 percent.

No Complete Substitute

Substitutes for industrial diamonds include other abrasive materials, as well as processes designed to cut, bore, grind, and machine relatively hard products. None of these alternatives is a complete substitute for diamonds, and none can replace them for certain purposes where speed and uninterrupted operation are factors of prime importance.

Modern industry is geared for volume output, and any slowing in the passage of partly fabricated materials through a production line can be very costly. Cutting tools and abrasives other than the diamond have a relatively short life and must be resharpened or replaced at frequent intervals. Therefore, the greater cost of diamond tools employed in machining and grinding is more than offset by the time saved in reducing periodic shut downs.

The more common partial substitute materials for industrial diamonds are cemented tungsten carbide, silicon carbide, natural corundum, and fused aluminum oxide. Recently ceramic products consisting of finely divided aluminum oxide cemented or sintered with a suitable binder have been developed which are said to be effective at elevated temperatures and at high cutting speeds.

Figure 1 shows the relative hardness and abrasive efficiency of the diamond compared with such materials as boron, silicon, and tungsten carbides, as well as alumina and quartz.

As concrete examples the hardness of either boron or silicon carbide as measured by abrasive tests (Woodell)¹ is less than half that of the diamond, and according to the Knoop indenter test² the hardness of these two alternate products is approximately one-fourth that of the diamond. Moreover, the brittle character of boron carbide (the harder of these two products) is such that so far it has not proved to be a very satisfactory abrasive.

¹ Comparing the Hardness of Materials, C. E. Woodell, Trans. Electrochem. Soc., Vol. 68, 1935, pp. 111-130.

² Knoop Hardness of Hard Substances and Factors Affecting Its Determination, N. W. Thibault and H. J. Ninquist, Trans. Am. Soc. Metals, Vol. 38, 1947, pp. 271-353.

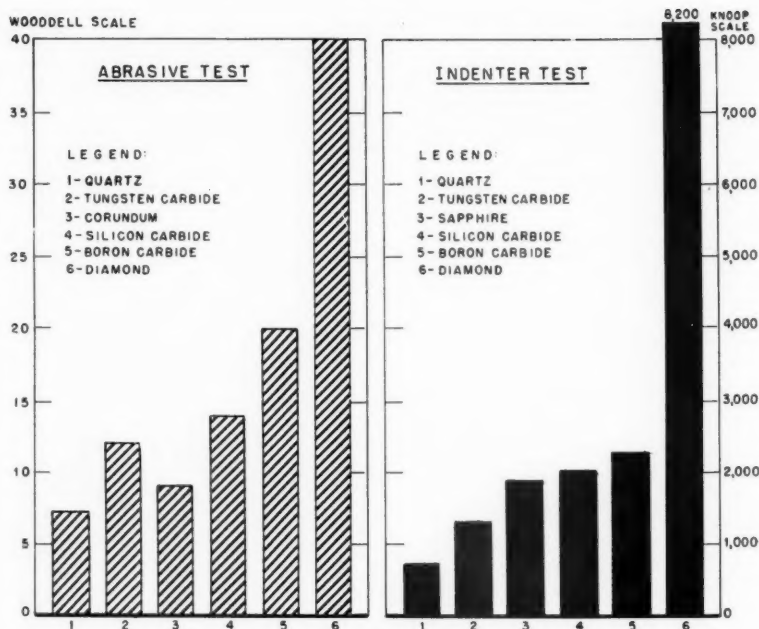


Fig. 1.—Relative hardness of the diamond and various other abrasive products compared to quartz according to two types of testing.

Nevertheless these partial substitutes have taken over some of the lighter duties formerly performed by industrial diamonds. Furthermore the research investigations now being conducted by the Bureau of Mines with the objective of improving the hardness and toughness of certain carbides may result in the development of improved abrasive materials.

In 1952 and 1953 the Minerals and Metals Advisory Board, National Research Council, issued reports on new processes for machining and grinding

that promised to conserve industrial diamonds. In addition to discussions of the potentialities of the silicon carbide wheel and belt grinding, the principles of electrodischarge, electrolytic and electrosonic abrasive grinding were explained in considerable detail. Considerable knowledge has been acquired concerning these alternate grinding methods but they are not as yet being used to any great extent. Further development of these processes is highly desirable since it has been shown that they can



General Electric Company's huge press for producing diamonds synthetically.

perform in part at least the functions of the industrial diamond.

Synthetics

In February 15, 1955, the General Electric Co. announced that it had succeeded in manufacturing diamonds by synthetic means. Details of the process employed have not been published, but high temperatures and enormous pressures are required.

Although it seems unlikely that diamonds will be synthesized in the near future at a cost commensurate with that of natural stones, this discovery is a major technical accom-

plishment that eventually can have a far-reaching effect.

Sapphires, rubies, graphite, ammonia and many complex organic compounds are being successfully synthesized on a commercial scale, yet at one time the economic problems involved appeared to be almost as insurmountable as those that must be solved before synthetic diamonds can be produced at a low cost. Even if the price of synthetic diamonds cannot be reduced to a point where they are competitive with natural stones, they offer a means of making up a diamond deficit in time of emergency.

Sheet Mica

MICA is a group name applied to a number of silicate minerals that crystallize in a booklike form with well-developed cleavage planes.

Muscovite or potash mica and phlogopite, the magnesia mica, are the most important types from an industrial standpoint.

Whereas mica is widely distributed in nature and is present in many rocks, deposits of high quality sheet mica are relatively scarce; and the known reserves in the United States, even if fully exploited, could supply our needs for only a few years. Moreover the mining and preparation of sheet mica for the market involve much hard labor, and hence the cost of production in this country is relatively high. Under normal conditions over 90 percent of the high quality sheet mica consumed in the United

States is imported from India, Brazil and Africa, where a low wage scale prevails.

Imports of sheet mica (block, film, and splittings) from various sources in 1954 were 7,289,000 lb.

As is true for industrial diamonds, the value of sheet mica depends principally on its unique physical properties. High quality sheet mica can be split into very thin, uniform sheets, which are tough, flexible, stable at temperatures up to 400° to 700° C., and have a high electrical resistance.

Sheet mica, however, varies greatly in quality; structural imperfections and the presence of certain impurities detract greatly from its value, and if these defects and impurities are excessive the mica may be suitable only for scrap.

To maintain domestic production at its present rate of about 850,000 lb a year, this Government is paying substantial premiums for high quality sheet mica mined in the United States.

The better qualities of sheet mica are marketed in the following three forms:

- (1) Block mica, having a minimum thickness of 0.007 in.
- (2) Mica film, ranging in thickness from 0.0012 to 0.007 in.
- (3) Mica splittings having a maximum thickness of 0.0012 in.

Variety of Uses

Sheet mica in the form of block, film, and splittings is employed for a wide variety of purposes, but since the development of radio, television, radar, and other types of electronic equipment the uses of the higher qualities of block and film have undergone a profound change.

Substantial quantities of block mica are still employed for non-electronic purposes where transparency, flexibility, and resistance to heat and vibration are factors of prime consideration, but the bulk of the better qualities is used as spacers and supports for the fine wires in electronic tubes.

Nearly all of the mica film marketed is used in manufacturing electric condensers or capacitors. The functions of a capacitor are to store electricity, raise voltage levels, and reduce losses in power-distribution systems. In smoothing fluctuations in the flow of current, their action is somewhat similar to that of a surge

TABLE 5.—FABRICATION OF MUSCOVITE RUBY AND NONRUBY BLOCK AND FILM MICA AND PHLOGOPITE BLOCK MICA, BY QUALITY AND END-PRODUCT USE (In pounds) IN THE UNITED STATES, 1954¹

Variety, form, and quality	Electronic uses				Nonelectronic uses			Grand Total
	Capacitors	Tubes	Other	Total	Gage glass and diaphragms	Other	Total	
MUSCOVITE:								
BLOCK:								
Good Stained or Better....	867	57,668	1,306	59,841	6,532	1,160	7,692	67,533
Stained	19,514	1,381,850	28,018	1,429,382	4,105	65,810	69,915	1,499,297
Lower Than Stained.....	13,295	331,256	78,451	423,002	30	1,131,726 ²	1,131,756	1,554,758
Total	33,676	1,770,774	107,775	1,912,225	10,667	1,198,696 ²	1,209,363	3,121,588
FILM:								
First	16,121	—	—	16,121	—	84	84	16,205
Second	72,886	—	—	72,886	—	230	230	73,116
Other	8,248	—	—	8,248	—	—	—	8,248
Total	97,255	—	—	97,255	—	314	314	97,569
BLOCK AND FILM:								
Good Stained or Better ³ ...	89,874	57,668	1,306	148,848	6,532	1,474	8,006	156,854
Stained ⁴	27,762	1,381,850	28,018	1,437,630	4,105	65,810	69,915	1,507,545
Lower Than Stained	13,295	331,256	78,451	423,002	30	1,131,726	1,131,756	1,554,758
Total	130,931	1,770,774	107,775	2,009,480	10,667	1,199,010	1,209,677	3,219,157
PHLOGOPITE:								
BLOCK (all qualities)	—	20	1,144	1,164	—	13,206	13,206	14,370

¹ Source of Information, Bureau of Mines, U.S. Department of the Interior.

² Includes punch mica.

³ Includes first and second-quality film.

⁴ Includes other-quality film.

tank in a hydraulic system, preventing excessive changes in pressure.

Splittings—thin, irregular pieces of various sizes—are the cheapest form of better quality sheet mica and constitute the bulk of that consumed. Whereas splittings have little or no industrial value in the raw state, when manufactured into built-up mica products they are used as insulation for electric generators, motors, and transformers.

Since splittings are a byproduct obtained in preparing Indian block and film, they are considered under the heading, "Salvage."

The quantities of block and film of several qualities fabricated for various end uses in 1954 are stated in Table 5, and the quantities of built-up mica (manufactured from splittings) sold or used for various purposes during the same year are noted in Table 6.

Salvage

Sheet mica has been salvaged in the form of splittings for over 60 years. The development of processes whereby overlapping layers of splittings could be cemented to form uniform sheets and plates opened up a large market for discarded material previously regarded as waste.

It was found that built-up mica manufactured from imported splittings could be cut, stamped and molded into products suitable for insulating various types of electrical equipment. This development greatly relieved the drain on the limited supplies of block mica and was largely responsible for the early and rapid growth of the electric power industry.

Built-up mica, however, cannot replace the better qualities of block mica used in electronic equipment.

Additional salvage is effected in cobbing, rifting, processing, and fabricating sheet mica; but the by-

TABLE 6.—BUILT-UP MICA¹ SOLD OR USED IN THE UNITED STATES, 1954, BY KINDS OF PRODUCTS²

Product	1954	
	Pounds	Value
Molding plate	1,184,965	\$ 2,213,392
Segment plate	1,504,028	2,778,582
Heater plate	580,846	1,681,071
Flexible (cold)	355,608	946,862
Tape	2,130,759 ³	7,672,310 ³
Other	149,582	537,433
Total	5,905,788	\$15,829,650

¹ Consists of a composite of alternate layers of a binder and irregularly arranged and partly overlapped splittings.

² Source of information, Bureau of Mines, U.S. Department of the Interior.

³ Includes a small quantity of built-up mica for "other combination materials."

product recovered is largely scrap mica, which has entirely different end uses from those of block and film.

The possibilities of employing scrap mica in manufacturing substitutes for sheet mica are discussed below.

Substitutes

Both organic and inorganic materials are being substituted for the lower qualities of sheet mica and for some purposes give satisfactory performance. Cotton, silk, and various synthetic plastics are among the organic insulating materials employed, but the usefulness of these substitutes is limited because they decompose at elevated temperatures.

Inorganic materials, such as molded glass, woven glass fiber, and special ceramic products, though having certain desirable dielectric properties, are not well adapted for purposes where very thin, nonporous flexible insulating sheets are required.

During the past few years, however, certain products, included under the broad heading of "reconstituted mica," have been developed that promise to be substituted in substan-

tial quantities for the less strategic qualities of natural block and film, as well as for built-up mica manufactured from imported splittings.

Reconstituted mica is produced from high quality scrap by a series of carefully controlled steps. The scrap is first delaminated by partial dehydration or by combined heating and chemical treatment, and then ground and screened. The fine flakes are then pulped with water and fed to a modified papermaking machine, where the material is formed into a thin, uniform, continuous sheet which is wound on rolls. The product is rather fragile and hence a binder must be applied to give the sheets the necessary strength and flexibility, as well as to reduce their porosity.

Another type of reconstituted mica, called "integrated mica," does not involve mechanical grinding or application of heat and chemicals. This product is made by delaminating fairly large size mica scrap by jets of water under heavy pressure. The inventor claims that the surfaces of the mica flakes split in this way are in a nascent state and when overlapped

(Continued on page 122)



Sheet mica controls our communication and transportation facilities. The grid resistors in this diesel electric locomotive contain from 150 to 200 lb of mica insulating parts.



Wheels of GOVERNMENT



As Viewed by HARRY L. MOFFETT of the American Mining Congress

THE political battle lines have been drawn as a result of the Chicago and San Francisco Conventions of the major parties. Eisenhower and Nixon vs. Stevenson and Kefauver and the records and promises of the Republican and Democratic Parties will be the bill of fare served up to the Nation between now and November.

A review of the platforms of the two parties discloses these stands of interest to the mining industry:

Labor—The Democratic Party advocates outright repeal of the Taft-Hartley Act and promises adoption of a new "legislative approach" to the entire labor-management problem, based on "past experience and the principles of the Wagner National Labor Relations Act and the Norris-LaGuardia Anti-Injunction Law." The Republicans call for a continuation of the process of free collective bargaining with labor and management settling their differences at the bargaining table "without the intervention of the Government."

Taxes—The Democrats seek tax adjustments for small business and lower income families. Favored is an increase in the personal tax exemption of \$600 "to a minimum of at least \$800." The Republicans seek a continued balanced budget, reduction of the Federal debt and then reductions in taxes on low and middle income families and small business. They also promise to press for correction of inequities in the tax laws.

Natural Resources—The Democratic platform calls for a "full and integrated program of development, protection, management and conservation of all of our natural resources for all of the people"; encouragement of prospecting and mining of undedicated Federal lands but with surface areas not needed in mining "safeguarded by appropriate legislation"; a renewal of the multiple-purpose river basin development program; adoption of programs to provide abundant sup-

plies of low-cost energy "including continued research for the development of synthetic liquid fuel from coal, shale and agricultural products"; increased Federal power projects; and adoption of "policies which will further encourage the exploration and development of additional reserves of our mineral resources."

The Republican platform takes credit for revision of the mining laws to encourage multiple use of the public domain; promises continuation of present public lands policies; calls for a "long-term policy for the development and prudent use of domestic mineral resources, and to assure access to necessary sources abroad, without dangerously weakening the market for domestic production of defense-essential materials"; favors "reasonable depletion allowances"; urges "freedom of mineral producers from unnecessary governmental regulation"; and favors further mineral exploration and research programs, and continuation of stockpiling. It also calls for continuation of the partnership policy in respect to water resource development.

Trade—Both parties favor continuation of the present foreign trade program and both express the view that domestic industries should receive protection from foreign imports when the well-being of such industries is seriously affected.

Atomic Energy—The Democratic Party pledges to increase production of fissionable materials for stockpiling and acceleration of the atomic power program. The Republican Party calls for further relaxation of the Government monopoly over atomic energy and stimulation of private enterprise in developing atomic energy uses for peaceful purposes.

Not only will the party platforms and the record of the Administration come in for both praise and attack in the coming campaign, but the record

Washington Highlights

POLITICAL PLATFORMS: Natural resources views

TAXES: Congressional studies under way

COAL EXPORTS: Liberty ships sought

MINERALS PURCHASES: Programs advance

FREIGHT RATES: Roads to seek hike

OIL IMPORTS: Firm restrictions requested

CUSTOMS SCHEDULES: Being reviewed

MINERALS EXPLORATION: Funds increased

of the 84th Congress will be subjected to partisan interpretation to the voters by candidates for office throughout the land. That it was a hard-working Congress cannot be denied. It approved almost 3000 measures out of a total of some 16,000 introduced, and a great many of those not approved went through the hearing stage. While a number of measures of interest to industry became law, a fairly large number were sidetracked—many of which are likely to be reintroduced at the next session.

Congress approved these important measures that affect the mining industry; the minerals purchase programs extension measure, the new highway bill, continuation of the Defense Production Act and authority to conduct mineral expansion and procurement programs, a revised Social Security law, expansion and extension of the Water Pollution Control Act, a revised version of the Contract Renegotiation Act containing the raw materials exemption, an extension for another year of the 52 percent corporate tax rate and certain excise taxes, and revision of the mining laws to provide a procedure for clearing up titles to mining claims while preserv-

ing the vested rights of mining claimants.

Sometimes failure of Congress to act on measures is of equal significance, and this was the case in the 84th Congress when the national lawmakers failed to act on bills to destroy the "good faith" defense in price discrimination cases, to require prior notice to the Federal Trade Commission of corporate mergers and acquisitions, to Federalize industrial safety, to require Federal inspection of metal and nonmetallic mines and quarries, to weaken the Taft-Hartley Act, and to change Federal land policies to the extent that miners would be unable to explore and develop minerals on a large part of the public domain.

Tax Study Under Way

The staff of the Joint Committee on Internal Revenue Taxation, at the request of Finance Committee Chairman Byrd (Dem., Va.), is undertaking a broad study of 15 facets of the Federal tax laws. Another tax study is being made by a subcommittee of the House Ways and Means Committee.

The Joint Committee staff has been directed to submit recommendations early next January. It is looking into these subjects: So-called tax "loopholes"; the effect of Federal income and estate taxes on small businesses; the income tax treatment of capital gains and losses; excise taxes; taxes imposed on life insurance companies; "inequities" in the 1954 tax code; accelerated amortization of defense facilities; net loss carry-over provisions of the revenue laws; tax treatment of annuities; taxation of prepaid income and reserves for estimated expenses; tax treatment of disabled and handicapped persons; taxation of individuals and corporations doing business abroad; present priority of Federal tax liens in view of recent decisions of the Supreme Court; the possibility of accelerating the Internal Revenue Services' statistics of income, and suggestions for simplifying the individual income tax return.

It is expected that the Committee staff will work closely with officials of the Treasury Department in developing their recommendations.

Meanwhile, a Cabinet Committee on Small Business has submitted recommendations to the President for tax aid to small businesses which it estimated would result in loss of some \$600 million in revenue in the first year. These recommendations call for reduction of the present 30 percent corporate normal tax to 20 percent on the first \$25,000 of corporate income; authorization for taxpayers to use the new methods for accelerating depreciation in the 1954 Revenue Code on purchase of used property not exceeding \$50,000 in any one year; and permission for corporations with ten or fewer stockholders to exercise the option of being taxed as a partnership or as a corporation.

The Committee also recommended simplification of Government procurement policies to aid small businesses; more opportunity for small business to obtain Government contracts; simplification of employer wage reporting for social security and income tax withholding purposes, and reducing the number of reports required of small business.

Liberty Ships Sought for Coal Exports

The newly-formed American Coal Shipping, Inc. has petitioned the Federal Maritime Board to approve the charter of 30 Government-owned Liberty ships for use in exporting coal to Europe, and a board examiner has recommended the break-out of this number of ships.

The Federal examiner, C. W. Robinson, made this recommendation following hearings at which representatives of the coal industry and the United Mine Workers urged approval of the petition. Opposition to the proposals was expressed by individual steamship lines and by spokesmen for ship-owner's associations.

In recommending approval of the ship break-out, Robinson said that charter of the vessels should be granted upon condition that (1) for a trial period minimum freight rates approved by the Maritime Board be charged, (2) the ships be forbidden to carry any bulk cargo other than coal, (3) the fee for the charter be a percentage of the ships' value, and (4) the company pay the cost of readying the ships for use.

The coal shipping company told the Board that it objected to the conditions attached to the examiner's recommendations. It said that no testimony was advanced at the Board hearing that would in any way indicate that the company planned to engage in an intentional loss operation with the purpose of depressing coal shipping rates. It also declared that limiting the company's cargoes to coal would be another obstacle placed in its way solely for the benefit of foreign ship operators. It reiterated its belief that the Board should charter the ships for an indefinite period subject to an annual review.

During the Board hearing, representatives of the coal shipping organization had made it quite plain that it planned to carry iron ore, manganese and other commodities inbound. They had also pointed out that the 30 Liberty ships would carry about 2.5 million tons of coal abroad annually against an anticipated movement of over 40 million tons a year.

Minerals Purchase Machinery Established

Following close on the heels of approval of the revised purchase programs for domestic tungsten, asbestos,

fluorspar and columbium-tantalum, the Interior Department took the first step in carrying out the new law by delegating authority to the General Services Administration to make purchases of these minerals. At the same time, the Interior Department authorized GSA to accept July offerings of domestic tungsten from producers.

Meanwhile, GSA has established a domestic purchase program for metallurgical grades of fluorspar which is expected to last for about two years. Under the program, GSA will pay domestic producers prices ranging from \$28.50 to \$38.50 per short dry ton, f. o. b. shipping point, depending on grade.

As this is written GSA has not announced purchase regulations for other minerals to be procured under the new law or under a delegation of authority by the Office of Defense Mobilization under the Defense Production Act.

Another Freight Rate Increase?

Another request by the railroads for a hike in freight rates appears to be in the offing. Eastern railroad representatives met in New York early in August and held preliminary discussions of their future revenue needs. News reports emanating from this meeting held that the carriers were laying the groundwork for a request to the Interstate Commerce Commission for a five percent freight rate boost. Some reports stated that certain coal-carrying railroads might not seek increases in their rates.

Towards the end of August, representatives of the eastern railroads conferred with officials of the ICC, and it was announced that the discussions dealt with procedure rather than with a specific rate increase proposal. Seasoned observers, however, say this meeting is a tip-off of the carriers' intention to request a rate boost in the near future.

Earlier this year the railroads were granted a freight rate increase averaging about 6 percent across the Nation.

Oil Import Restriction Asked

Administration action to restrict oil imports under terms of the national security provision of the Trade Agreements Act is being sought by the Independent Petroleum Association of America. The Association has filed a petition with ODM calling for such action, but it is not expected that the mobilization agency will hold public hearings until a Task Force of the President's Advisory Committee on Energy Supplies and Resources Policy and an interdepartmental Government committee studies the petition. The Task Force recently met in Washington and is expected to re-

(Continued on page 125)



Personalals

H. C. Livingston, vice-president in charge of operations of Truax-Traer Coal Co. since January 1952, has been elected president of the company.



A. H. Truax, chairman of the board, had served as president as well as chairman of the board since the retirement of R. E. Snobberger in 1955.

Livingston came to Truax-

Traer from Union Pacific Coal Co. where he had been vice-president of operations. He was elected a director of Truax-Traer in 1952.

At the same time it was announced that **Harry LaViers**, president of Southeast Coal Co., for which Truax-Traer is sales agent, was elected a director of Truax-Traer succeeding **George A. Stevens**, who has resigned.

A. L. Hayes will serve as manager. **R. E. Radabaugh** will be in charge of mining operations, and **K. C. Apland** will be mill chief of the Mexican Hat, Utah, uranium operation of the Texas-Zinc Minerals Corp., a new corporation jointly owned by the New Jersey Zinc Co. and the Texas Co.

Hayes will make his headquarters at Grand Junction, Colo.

J. M. Stauffer, who has been treasurer of Consolidation Coal Co. (Ky.) Division of Pittsburgh Consolidation Coal Co. for the past nine years, retired July 1 after having completed 45 years with the company. He originally started working for Consol in Pennsylvania in 1911, and was transferred to Coalwood, W. Va., in 1924. In 1928 he went to Jenkins, Ky., and served as clerk, chief clerk, assistant treasurer and treasurer.

The appointment of **Robert Sheldon** as general superintendent of Resurrection Mining Co. with headquarters in Leadville, Colo., has been announced. He had been employed with the geological exploration department

of the Newmont Mining Corp. at Grass Valley, Calif. He will supervise and be in direct charge of expediting the move to get the Resurrection into production.

Thomas L. Aitken has been elected a vice-president of Penn-Texas Corp. in charge of coal operations, and also president of the corporation's Pennsylvania Coal and Coke Division with headquarters in Cresson, Pa. He will supervise all operations of the corporation's bituminous coal mines in central Pennsylvania.

Aitken is a director of the Central Pennsylvania Coal Producers Association and a member of the Wage Scale Committee. He was recently vice-president of operations of the Ebensburg Coal Co.

Ralph W. Neyman resigned as general manager for Hecla Mining Co. July 1 to become president and general manager of Federal Uranium Corp. Following this move, **William H. Love** was named the new manager of mines for Hecla and **Herbert E. Harper** was named chief geologist.

Neyman, a veteran mining engineer and mine operator, worked for Hecla Mining Co. for 26 years directing mining operations in Idaho, Montana, California, and Utah. He had served as mining engineer, assistant chief engineer, general mining superintendent and general manager.

Love has been with Hecla since 1948 and has been superintendent of that company's Radon operation near Moab, Utah, the last year.

Harper succeeds **Robert E. Sorenson** who is moving to Seattle to take charge of a new venture of Polaris Mining Co. which is controlled by Hecla. Sorenson will continue to supervise mine exploration, but the engineering department will be placed under Love.



Ralph W. Neyman

Fred L. Shanklin has been appointed president of Union Carbide Ore Co., a division of Union Carbide and Carbon Corp. He succeeds **F. S. Haggerson** who is resigning for reasons of health.

Allen T. Cole has established an office in Lakeland, Fla., where he will engage in consulting work on the exploration, evaluation, mining and processing of industrial minerals. Dr. Cole was formerly manager of the Davison Chemical Company's Florida phosphate operations and more recently director of Atomic Energy Services for Grace Chemical Research and Development Co., both of the above being divisions of W. R. Grace and Co.

R. O. Hawkanson has been named vice-president—administrative for Oliver Iron Mining Division. Formerly Oliver's director of industrial relations, he began his new assignment



with the U. S. Steel mining division August 1. Hawkanson will be responsible for the direction and development of programs in areas pertaining to all employee-management relations within the division, the administration of Oliver's wage and salary program, the purchase and sale of timber and other non-mineral property, the activities of the division's traffic and industrial engineering departments, and the direction of administrative and organizational planning.

C. Houston Beaumont has become associated with the Tennessee Consolidated Coal Co. in an executive capacity. Since 1951 Beaumont has been connected with the Tennessee Valley Authority, first as procurement analyst and later as supervisor of the coal contracts section.

Several recent personnel changes have been announced by the Calaveras Cement Co., San Andreas, Calif.

T. L. Love, Sr., has been named assistant manager of the San Andreas plant of the company, filling a vacancy created in 1954 by the death of **Marion S. Heard**. Love joined the company as chief clerk in 1934. He had been plant personnel manager since 1948.

Earle M. Bagley, Jr., was appointed to the newly-created post of superintendent of raw materials. He joined Calaveras in 1954, serving first as a geologist in the plant's exploration

department, and for the past year as assistant quarry superintendent.

Edgar Andersen has taken over Bagley's former post as assistant quarry superintendent. Before joining Calaveras in 1946 as plant engineer, he was associated with Kennecott Copper Corp. and Consolidated Gold Fields, Ltd.

James C. Powell has been named Calaveras plant engineer.

Edward G. Fox has resigned as president of Reading Anthracite Co. to become president of the Bituminous Coal Operators Association. He succeeds the late Harry M. Moses who died last April.

Concurrent with the announcement



Ed. G. Fox



Geo. J. Clark

of Fox's resignation as president of the Reading Anthracite Co. was the announcement of the appointment of **George J. Clark** as his successor.

Fox has spent a lifetime in the anthracite industry and had been president of the Reading Anthracite Co. and its predecessor, the Philadelphia & Reading Coal & Iron Co., since 1951. He was also chief contract negotiator of the hard coal industry.

Clark joined Philadelphia & Reading in 1933 and in 1943 was appointed a division engineer. When P & R organized its Shen-Penn Production Co. in 1946 he became its chief engineer and one year later was made president. In 1951 he rejoined P & R as general manager and in 1954 he was elected vice-president and general manager.

Promotion of **W. Lynn Hart** to the new position of director of personnel, safety and training, of the Northwestern Mining Department of the American Smelting and Refining Co., has been announced.

Dr. J. D. Forrester has resigned as dean of the University of Idaho College of Mines and director of the Idaho Bureau of Mines and Geology to accept an identical position in Arizona. The resignation becomes effective October 1.

Forrester came to the University of Idaho in 1939 after teaching at Cornell University and the University of Utah. Until 1944 he served as professor and head of the Department of

Geology. From then until 1954, when he assumed his present duties, he was professor and chairman of the Department of Mining Engineering at the University of Missouri.

Eastern Gas & Fuel Associates has announced the following recent personnel changes.

C. J. Kirby has been appointed superintendent of the Helen mine in Raleigh County, W. Va., taking the place of **J. H. Benedict** who is taking a leave of absence because of ill health. Kirby was formerly production engineer of the company's Low Volatile Division. Benedict served as superintendent of the Helen operation since 1949.

R. H. Freeman has been transferred to the Low Volatile Division as production engineer. **J. B. Link, Jr.** replaces Freeman as resident engineer of Wharton No. 2. **John H. Kodad**, formerly assistant mine foreman at Keystone, has been appointed general mine foreman at Statesbury No. 10.

The M. A. Hanna Co. has announced the appointment of **Dr. Frederic M. Chace** as assistant director of exploration. Chace has had wide experience in geology and mining which has taken him to many

foreign countries, including Australia, Bolivia, Peru, Chile, Mexico and Canada. During the war he was with the War Production Board in Washington, and later with the U. S. Geological Survey. He came with the M. A. Hanna Co. originally in 1951, and in 1952 he joined the Gold Fields American Development Co., Ltd., the American subsidiary of Consolidated Gold Fields of South Africa, as mining geologist.



— Obituaries —

Jesse Manning Armantrout, 39, former superintendent of mines for the Brule Smokeless Coal Co., died July 24 in Mullens, W. Va.

Clarence C. Playter, 78, retired mine operator in the Tri-State lead district, died July 15 in Joplin, Mo.

Charles Edwin (Ed) Hough, 51, president and general manager of the Norton Coal Co., died suddenly at his home in Buckhannon, W. Va., August 3.

A graduate of Ohio State University, Mr. Hough entered the coal industry with Koppers Co. at Grant Town, W. Va., as an engineer. He then moved to the West Virginia Coal & Coke Co. and became superintendent of the Micco mine. His next move, was to the American Rolling Mill Co.,



Montcoal, W. Va., where he was general superintendent. Later he joined the New River Co. and still later went to work for the Imperial Smokeless Coal Co., becoming its general manager and vice-president. In November 1953 Mr. Hough purchased the West Virginia Coal & Coke properties at Norton, W. Va., which he operated as the Norton Coal Co.

In addition to operating his own company, Mr. Hough was president of the West Virginia Coal Mining Institute.

Martin B. Gentry, 69, retired mining engineer and a former vice-president of the Freeport Sulphur Co., died July 31 in Southern Pines, N. C., after a long illness.

After being graduated from Yale in 1906, Mr. Gentry served the Imperial Copper Co. in Silver Bell, Ariz., and the Tombstone Consolidated Mining Co. as surveyor, engineer, assistant mining superintendent and in other capacities. In 1912 he went to Chuquimata, Chile, with the Chile Exploration Co. Mr. Gentry joined Freeport Sulphur in 1935 as assistant to the president. He became a vice-president in 1941 and retired in 1949.

C. G. Willard, 69, a recognized authority in the ore-grinding field, passed away July 30 in Denver following a serious illness of almost a year. Mr. Willard joined the Mine & Smelter Supply Co. in 1918 as assistant manager of the Marcy Mill Division. Later he became manager of this Division, a director of the Mine & Smelter Supply Co., executive vice-president and director of Colorado Iron Works Co. Division of Mine & Smelter, and a vice-president of General Iron Works Co., the manufacturing division of the company.

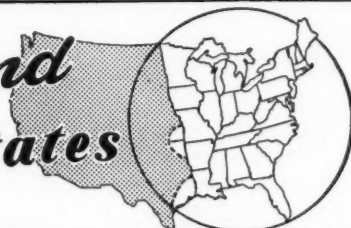
William Benton Wolf, 69, a Southern West Virginia coal official, died July 15 at Montgomery, W. Va. Mr. Wolf joined the Kanawha-Hocking Coal Co. as an engineer in 1912 and was later appointed general superintendent. Warner Colliery Co. later bought the Kanawha-Hocking Coal Co. and Mr. Wolf served as vice-president and general manager of Warner Collieries until his retirement in 1952.

NEWS

and VIEWS



Eastern and Central States



Pitt Consol and Pocahontas Fuel Talk Merger

George H. Love, president of Pittsburgh Consolidation Coal Co. announced August 22 that the directors of the company had called a special meeting of shareholders for November 5, 1956 to vote upon an increase in its authorized capital stock. He stated that the purpose of the increase was to enable the company to make an offer to the shareholders of Pocahontas Fuel Co. Inc. to acquire their stock on the basis of 2% shares of Pittsburgh Consolidation for each share of Pocahontas Fuel. There are presently outstanding 972,800 shares of Pocahontas Fuel Co. stock. Before an offer of exchange can be made, a Registration Statement under the Securities Act of 1933 must be filed by Pittsburgh Consolidation and have become effective.

Pocahontas Fuel produces exclusively low volatile coal from its mines in Southern West Virginia and Virginia. It also leases and operates a small property in Tennessee.

Pitt Consol, on other hand, produces no low volatile coal and has no low volatile coal reserves. It operates mines in the high volatile fields of Western Pennsylvania, Ohio, Northern West Virginia and Eastern Kentucky.

If the exchange is consummated, Love would become chairman of the board of Pittsburgh Consolidation and A. R. Matthews, president of Pocahontas Fuel, would also become president of Pittsburgh Consol. The Pocahontas Fuel properties would continue to be operated under the existing management of that company.

The industry's leading producer, Pitt Consol mined 28,001,000 tons of coal last year (including production under company supervision). Pocahontas Fuel ranked seventh in the industry with an output of 8,464,325 tons. Combined, the two companies were responsible for just over 7.75 percent of the 470,000,000 tons of coal produced in 1955.

Last year, Pitt Consol reported sales of \$168.6 million and year-end assets of \$230 million. Pocahontas Fuel had sales of \$94.8 million and assets of \$70.4 million at the end of the year.

Wisconsin Taconite

The Ashland Mining Corp. an affiliate of the McLouth Steel Corp., Detroit, has purchased 154 parcels of land near Agenda, Wis., for use in connection with its proposed new taconite plant in that area. The lands are in the same region where the corporation owns other property now

being explored for mining of low-grade ore for taconite. The new plant, to be built at a reported cost of \$25,000,000, is expected to be in operation within the next five years.

Coal Properties Change Hands

Gauley Mountain Coal Co. and its coal properties near Ansted, Fayette County, W. Va., have been sold to a new corporation which will retain the name of Gauley Mountain Coal Co. for the purpose of operating the property.

James D. Ireland, Summersville, president of Peters Creek Coal Co., is president of the new company, and Robert D. Cowen, Cleveland, president of Monongahela & Ohio Coal Co., is vice-president.

Ireland and Cowen are owners of the property and will operate the new company without connection with the Peters Creek and Monongahela companies.

Harold F. Stanton will continue as manager of Gauley properties, which produce coal from the No. 2 Gas seam. The mine, which employs about 90 men, in 1955 produced 154,780 tons.

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Sheet Mica

(Continued from page 107)

cohere so that sheets can be formed without a binder. However, a small quantity of some binder is usually employed to reduce the porosity and strengthen the resultant sheet.

Facilities for manufacturing several forms of reconstituted mica are ample to meet present demands and in case of necessity can be expanded to replace virtually all of the built-up mica now manufactured from imported splittings.

A newly developed device that offers possibilities of replacing a substantial proportion of the vacuum tubes in which mica supports and spacers are now employed is the transistor. A typical transistor consists of a small piece of germanium attached to three wires imbedded in a bead of protective plastic. The whole assembly is less than the size of a pea, hence its substitution for the vacuum tube in electronic equipment offers the advantage of an immense saving in weight and space.

The present cost of the transistor is considerably higher than that of the vacuum tube, and it has certain objectionable features that still must be overcome; nevertheless, this device is being substituted for the electronic tube in computers, automation equipment, hearing aids, and other devices.

Synthetic Mica

This product is a true mica manufactured by melting properly proportioned mixtures of pure raw materials under carefully controlled conditions.

Although synthetic mica has been produced in the laboratory for fully 50 years, systematic investigations with a view to manufacturing it on a commercial scale were not undertaken in the United States until after World War II.

In 1947 this problem was assigned to the Federal Bureau of Mines, and a commercially feasible method of manufacturing synthetic mica by the internal electrical resistance method was developed.

Up to the present, however, these synthetic mica crystals have been small (two in. in diameter or less) and irregular in structure; hence they are not suitable for purposes where fairly large, flat, thin sheets of mica are required.

Investigations with the objective of producing large, regular crystals are still under way; meanwhile, dense, uniform products having excellent dielectric properties have been prepared by submitting finely ground synthetic mica to heavy pressure at 600° to 1030° C., with and without a binder, such as phosphoric acid.

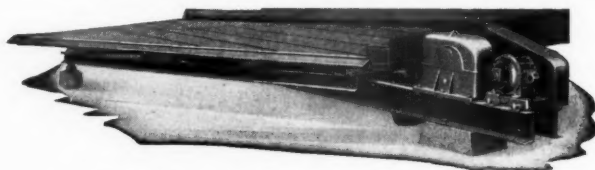
This hot-pressing technique offers a promising means of producing

sheets of reconstituted synthetic mica suitable for electronic uses. The problem is to obtain thin, hot-pressed sheets with a higher flexibility, less porosity, greater strength, and improved electrical properties.

The Synthetic Mica Corp. (a subsidiary of the Mycalex Corp. of America) is building a plant to produce about 1000 tons of synthetic mica a year. Whereas most of the product will be ground for use in glass-bonded ceramics, the company also plans to study methods of im-

proving the size and quality of the synthetic crystals, so that they may replace natural sheet mica for strategic purposes, in part at least.

Obviously, the manufacture of large, regular crystals of synthetic mica at a reasonable cost would be a major industrial accomplishment and render this country independent of remote foreign sources for its requirements of what is now a highly strategic mineral. It seems reasonable to expect that eventually this problem will be successfully solved.



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Fine Coal Plant for Gary

Construction of a modern fine coal cleaning system and a thermal drying unit at U. S. Steel's Gary (W. Va.) District's Alpheus Central Coal Preparation Plant has begun.

The new additions are designed to improve quality and uniformity of clean coal, and are scheduled to go into operation in the third quarter of 1957. U. S. Steel's American Bridge Division will fabricate and erect the 4600 tons of structural steel, and Allen & Garcia, Chicago, will supervise general construction.

Fine coal is not cleaned at present at Alpheus washer but is added directly to the coarse washed coal before loading. With the fine coal cleaning system in operation the fine coal will then be washed and thermal dried before remixing with coarse coal for shipment.

In the new cleaning process the fine coal will be removed from run-of-mine by wet screening. Then the coal will be pumped from the fine coal sump to desilters for removal of slimes. The product from the desilters will be cleaned on Deister tables and dewatered in centrifugal bowl filters.

Clean coal from the centrifugal filters will be carried to surge bins located in the thermal drier section. The thermal dried coal will be oil treated for density control and to ease material handling and transferred by conveyor to the point where it will be combined with the coarse coal, mixed and loaded into railroad cars.

Rare-Earth Research

Michigan Chemical Corp., St. Louis, Mich., is expanding its facilities for research and production control of products and processes of its growing rare-earths business. It has authorized procurement of additional staff, scientific equipment, and library facilities.

WANTED—FIELD EDITOR—

Engineer or Geologist

HERE'S an excellent opportunity for an engineer or geologist with a few years' experience in the industrial minerals mining industry. Experience in cement operations, also in writing, helpful but not necessary. Leading magazine has good opening for competent man as Field Editor. Chicago headquarters, top salary. Address inquiries to Box 138, Washington, D. C., giving age, education, experience, marital status, etc.

Annual Coal Division Conference

William Penn Hotel, Friday, November 16, 1956

COAL MINING MEN, manufacturers of mining equipment and suppliers to the industry are cordially invited to be on hand November 16 at the William Penn Hotel in Pittsburgh for the Annual Conference of the American Mining Congress' Coal Division. Six committees will report on the work that has been completed this year and will recount the progress of current studies. Main purpose of the meeting is to present the various technical reports to the industry and to encourage the free interchange of information that has done so much towards raising coal mining to its present position of eminence.

In their work of spreading knowledge, the Coal Division committees study the practical application of mining machines and methods, to determine what is required for successful operation under widely varying conditions. The broad range of subjects to be covered at the November 16 meeting includes: Operation and Maintenance of Mechanical and Thermal Drying Equipment; Washery Water Clarification; Dust Control for Continuous Mining; Industrial Engineering; Roof Bolting Systems; Temporary Cable Splices; Permissibility Problems; Mine Lighting; Conveyor Installation, Operation and Maintenance; Rail Haulage Installation, Operation and Maintenance; and Revision of the Haulage Roads Booklet.

Committees and their chairmen are:

Committee on Coal Preparation

R. L. LLEWELLYN,
Eastern Gas & Fuel Associates

Committee on Conveyor Haulage

H. A. JONES,
Carbon Fuel Co.

Committee on Mechanical Mining

WM. E. HESS,
J. & L. Steel Corp.

Committee on Rail Haulage

J. D. REILLY,
*Hanna Coal Co., Div. of Pittsburgh
Consolidation Coal Co.*

Committee on Roof Action

J. A. BROOKES,
Mather Collieries

Committee on Underground Power

J. A. DUNN,
Island Creek Coal Co.

Cherry Hill Acquires George's Creek

Cherry Hill Coal Corp., with general offices in Cleveland, Ohio, has purchased the entire common stock of George's Creek Coal & Land Co. of Lonaconing, Md., and its wholly-owned subsidiary, the George's Creek Fuel Co. with main offices in Cumberland, Md. Cherry Hill acquired 2000 acres of coal lands in Allegany County, Md., and 8000 acres in Garrett County. Estimated remaining coal reserves are in excess of 30,000,000 tons. The business will continue as the George's Creek Fuel Co. and no change in present personnel is contemplated.

Cherry Hill Coal Corp. owns and operates the Cherry Hill deep mines at Morgantown, W. Va., and the Lucille Tipple at Hord, W. Va., on the Monongahela River. The company recently acquired a large lease of coal lands in Elk County, Pa., and is currently operating the Mead Run Strip at Helen Mills, Pa., on the Erie Railroad. Cherry Hill also owns the McGeorge Coal Co., the Cherry Hill Coal Co. of West Virginia, and a railway supply division, The Cox-McGeorge Co.

George's Creek Coal & Land Co. was first organized in 1837 and has been in continuous business since.

Donald B. Gillies Retires

After almost 50 years of continuous service with Republic Steel Corp. and Corrigan, McKinney Steel Co. (a Republic predecessor organization), Donald B. Gillies has fully retired from active service.

Gillies was a vice-president of Republic Steel until his 75th birthday in 1947, after which he continued a full and active business life as a mining consultant for Republic. In announcing Gillies' retirement, C. M. White, Republic president, said: "His work has been of tremendous value to Republic in its mining and exploration ventures."

Gillies' most important contributions to Republic have had to do with raw material reserves. In 1937 he interested Republic in the iron ore possibilities of the Northern Adirondacks, and revived the almost dead iron ore industry in that area. In the late 1940's he investigated and recommended to Republic the rich iron ore deposits in Liberia, in which the company had acquired a majority interest and which is now in full operation.

Within the past two years he has been instrumental in exploring an important deposit of rutile in Southern Mexico. Through a Mexican subsidiary, Republic has acquired this deposit and is developing it now and will have mining and concentrating equipment in operation in 1957. The Mexican Government is now building roads and installing docks.

A.Z.I. Gets Larger Offices

The American Zinc Institute, national trade association of the zinc industry, last month moved to new and larger offices in the Lincoln Building, 60 East 42nd Street, New York 17, N. Y.

New Anthracite Breaker

An all-steel anthracite breaker of completely new design is being erected at Audenried, near Hazleton, Pa., by Glen Alden Corp. The breaker will have an annual capacity of about 250,000 tons, and its estimated cost is in excess of \$1,000,000.

It is the first breaker to be built in the region in several years.

Glen Alden has substantial reserves of anthracite in the Audenried area, the site of an earlier Glen Alden breaker which was abandoned and dismantled in 1952.

Glen Alden's president, Francis O. Case, said improved labor relations,

a more realistic industry production control plan, and the improved general status of the industry's outlook were factors influencing the company's decision to invest in the new facility, slated for operation by late fall of this year.

Glen Alden built its last major breaker at the Huber Colliery, Ashley, Pa., in 1939. Other company breakers have been substantially rebuilt since then, but the Audenried breaker will be the first to be constructed from the ground up in the past 17 years.

Coal Mines Reactivated

Two coal mines in West Virginia's Gauley field, both closed for some time, have been reactivated and are in production.

Tioga No. 5 mine, formerly operated by Tioga Coal Corp. is now being operated by Gauley Eagle Coal & Coke Co. as Gauley Eagle No. 3.

Turkey Creek No. 2 mine, near Jerryville, has been taken over by Raymond Floyd of Summersville. This deep mine in the Sewell seam was formerly operated by Pike Coal Co.



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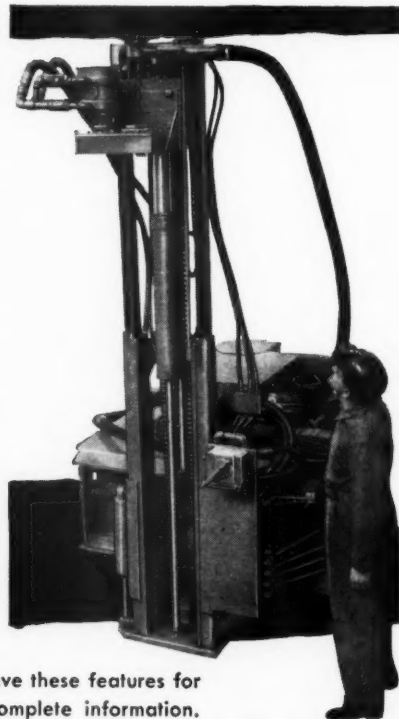
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Wheels of Government

(Continued from page 118)

commend a plan for holding oil imports of all types to the level of the 1954 ratio to domestic production.

Prior to the adjournment of Congress, 31 Senators requested Defense Mobilizer Arthur Flemming to take remedial action to assure the restriction of oil imports to the 1954 level.

Meanwhile, ODM announced that public hearings would be held on September 13 on a petition of the fluorspar industry seeking relief from excessive imports under the national security provision of the Trade Agreements Act.

Customs Schedules Under Review

A comprehensive study of laws prescribing the tariff status of imported articles is being conducted by the Tariff Commission, results of which will be submitted to the President and the chairmen of the Senate Finance and House Ways and Means Committees by March 1, 1958.

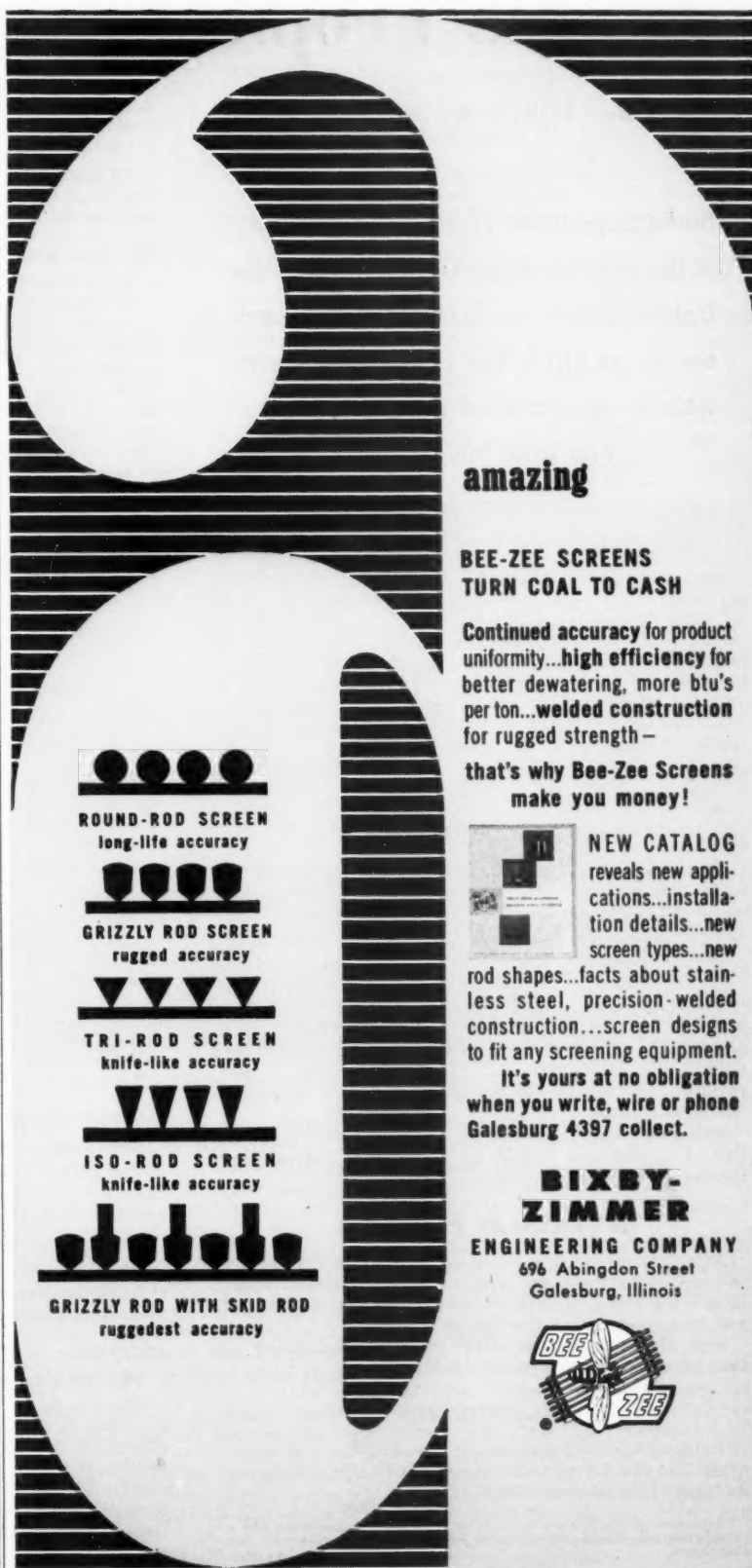
The study has as its purposes (1) the establishment of up-to-date schedules of tariff classifications, (2) elimination of anomalies and illogical results in the classification of articles, and (3) simplification of the determination and application of tariff classifications.

Domestic producers, importers and others interested have been invited by the Commission to submit any suggestions that might aid in achieving these purposes. Following their consideration, the Commission will draft revised tariff schedules which will be made public, and hearings will then be held to permit interested parties to express their views, particularly as to the impact of the new schedules upon domestic industry.

Exploration Funds Increased

A request of the Defense Minerals Exploration Administration for \$6 million in additional borrowing authority for conduct of the minerals exploration program during the fiscal year 1957 has been approved by the Office of Defense Mobilization. ODM has thus far authorized a total of \$34 million for the minerals exploration program.

Meanwhile, the Atomic Energy Commission has eased its regulations to eliminate the requirement that uranium producers submit proof that funds received for "development allowances" were spent for exploration and development during the contract period or within six months thereafter. AEC said elimination of this requirement would permit maximum use of the development allowance as an incentive to uranium exploration and would simplify administration of the program.




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We, the People

By GEORGE W. NILSSON*

Lawyer

Since September 17 is the anniversary of the signing of the Constitution of the United States, we thought it appropriate to publish the following essay which was included in a communication from Mr. Nilsson.

I—ENEMIES OF THE CONSTITUTION

"The Constitution has but two enemies, whether foreign or domestic, who are in the least to be feared. The first of these is *ignorance*—ignorance of its contents, ignorance of its meaning, ignorance of the great truths on which it is founded and of the great things that have been done in its name. And the second is *indifference*—the sort of indifference which leads many people, otherwise well enough behaved, to ignore both the rights and duties of citizenship."

— John W. Davis

II—THE CONSTITUTION

September 17 is the anniversary of the signing of the Constitution of the United States. It was written and adopted in fulfillment of the Declaration of Independence

"... That to secure these rights Governments are instituted among men deriving their just powers from the consent of the governed. . . ."

The Constitution was written and adopted by the Convention, but was submitted to the vote of the people, since the Preamble recited that "We, the people" ordained and established it. After long debate it was ratified, but only on the promise that a Bill of Rights would be added.

The new government began functioning in 1789. A Bill of Rights was passed by the First Congress and became effective September 15, 1791.

III—PRESENT PROBLEMS

After more than a century and a half, again we are seriously debating many provisions of the Constitution. It is being attacked from without; and it is undermined and by-passed within the United States.

How shall the citizen know what his rights are so that he may arrive at right decisions?

IV—REMEDIES

To meet the two enemies of the Constitution—ignorance and indifference—we need Knowledge and Active Interest in its preservation.

* Secretary of the Mining Association of Southern California and a member of the Committee on American Citizenship, American Bar Association.

KNOWLEDGE—The Honorable John Jay, while Chief Justice of New York, said:

"Every member of the State ought diligently to read the Constitution of his Country and teach the rising generations to be free. By knowing their rights, they will sooner perceive when they are violated and the better prepare to defend and assert them."

To acquire and keep this knowledge of his Constitution, each citizen should have at least a working library, such as the following:

ON THE CONSTITUTION:

YOUR RUGGED CONSTITUTION: HOW AMERICA'S HOUSE OF FREEDOM IS PLANNED AND BUILT. By Bruce Allyn Findlay and Esther Blair Findlay.

This book makes it easy to read and understand the Constitution of the United States. An article or clause is printed on one page; on the opposite page is a clear and concise explanation of that article or clause. The type is large and there are many helpful drawings. The book should be in every home, readily available for study or reference.

THE GREAT REHEARSAL: THE STORY OF THE MAKING AND RATIFYING OF THE CONSTITUTION. By Carl Van Doren.

"THE FEDERALIST" (Modern Library #139, or Everyman's Library #519)

Essays in support of the adoption of the Constitution. Among the greatest dissertations on government ever written.

ON THE BILL OF RIGHTS:

GUARANTEED FOR LIFE: YOUR RIGHTS UNDER THE UNITED STATES CONSTITUTION. By Bruce Allyn Findlay

This book is similar in format to **YOUR RUGGED CONSTITUTION**. It discusses each personal right on a page and illustrates it with sketches. These are contrasted with conditions under Totalitarian rule.

THE FORGOTTEN NINTH AMENDMENT. By Bennett B. Patterson

The book gives the legislative history of the Ninth Amendment and judicial construction thereof. In the Appendix is a copy of the Resolution of the House of Representatives of August 24, 1789, proposing the Bill of Rights together with copies of the proceeding in the Senate and House of Representatives during the discussion and adoption of the first ten Amendments to the Constitution of the United States.

There is an introduction by Dean Roscoe Pound.

ON THE BACKGROUND OF OUR CONSTITUTION:

SPIRITUAL: THE KEY TO PEACE. By Clarence Manion

The author emphasizes that our institutions rest upon the conviction that every individual is a child of God and therefore of supreme worth.

HISTORICAL: SHORT HISTORY OF THE ENGLISH PEOPLE.

By Green (Everyman's Library, #727 & 728)

Read first chapter to learn how Freedom is given away for "Security"—thus losing both.

FICTION:

THE TREE OF LIBERTY. By Elizabeth Page

The life of a man from 1757-1806. Begins with him as a boy in the mountains when his parents have been massacred by the Indians. It carries him through the pre-Revolutionary days; his experience as a soldier, including Valley Forge; the difficult days of "The Critical Period"; the debates about the adoption of the Constitution, through the formative period of the U. S., to the election of Jefferson as President.

ON TRUTHS ABOUT THE WORKINGS OF RUSSIAN COMMUNISM:

Pamphlet issued by the American Bar Association: entitled "Brief on Communism: Marxism—Leninism; Its Aims, Purposes, Objectives and Practices"

VERDICT OF THREE DECADES. Edited by Julian Steinberg—(Duell, Sloan & Pearce, 1950)

This book covers the 30 years from 1917 to 1947. It is a collection of articles by Communists who took part in, or newspaper men who witnessed, the events written about. There is an illuminating introduction for each decade and a short editorial giving biographical data about each writer.

INTEREST — Convictions — Activity

In James, 2:16-20, we read that "Faith without works is dead."

It is said that in ancient Greece, the word "Idiot" meant a citizen taking no part in public affairs.

To know the Constitution and the Bill of Rights is fundamental, but not enough. There must be conviction,

courage and initiative, leading to action. The official oath is to "preserve, protect, and defend" the Constitution of the United States.

What is needed is the conviction, courage and initiative of the Pilgrims; of the soldiers of the American Revolution; of Daniel Boone and Davy Crockett; of the Mountain Men and the Pioneers who crossed the plains in covered wagons.

We have the same document which was signed in 1787 and became operative in 1789. We can have the same Constitution—provided its provisions are not ignored or by-passed.

We have the same convictions, initiative and courage—proved on the battlefields of three wars in our lifetime—but thrown away by timidity in high places.

Finally we have the same faith in the Creator who endowed "all men" with Life, Liberty and the opportunity for Happiness.

With Faith in God and with renewed faith in our ability to govern ourselves, we may say with St. Paul (2d Cor. 3-17):

"Where the Spirit of the Lord is, there is liberty."

Mine Lighting

(Continued from page 84)

operator and the shuttle car operator. Better housekeeping is another definite advantage. Supplies are more easily kept in order and fewer supplies are lost because anything on the mine floor is immediately visible to everyone. There is less fatigue of the workmen. We believe that the morale of the entire working force on this section is increased due to improved working conditions.

Equipment Costs

Cost of the equipment used in this experimental installation is not known because part of the equipment was furnished by manufacturers at no cost to the project. It is estimated that the equipment would cost between \$8,000 and \$10,000 although this is just a guess.

Power for the operation of a section lighting system of the approximate size of the experimental installation would be approximately \$40 a month for two-shift operation it is estimated.

The mine lighting system is an experimental installation and, as such, is not permissible for use in coal mines. The experimental installation of this equipment in an active mining operation was made possible through the cooperation of the personnel of both the W. Va. Department of Mines and the U. S. Bureau of Mines. Without their help the experiment would not have been possible.

We in Armco are very happy to have been given the opportunity to take part in this experiment. We believe the lighting of the active working area of coal mines has many advantages and that these advantages may well exceed expectations.

Adequate mine lighting will not solve all of our safety problems be-



Lights also make the section foreman's job easier

cause we have many accidents in which lighting is not a factor. Nor will it solve all our production problems. We believe it, however, to be

a desirable working tool; a help in the prevention of accidents; an aid to increased production; a means to improve working conditions.

New Tipple in Operation

Sunnyhill Coal Company's new loading tipple at Glouster, Ohio, is receiving coal from three district mines for shipment to the Picway Plant of the Columbus & Southern Ohio Electric Co.

The tipple is presently handling about 600 tpd, but can process 1000 tpd.

Supplying coal for the tipple are the Red Air and New Town mines in Murray City, and the Red Ash mine of Gloucester.

Coal is carried by conveyor from

the open-pit mine to the tipple. All waste material is returned to the mines, eliminating a refuse pile.

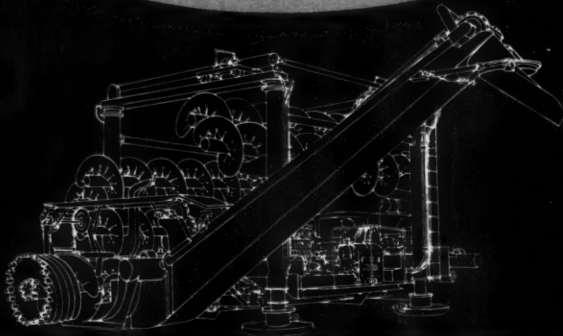
UMW Convenes October 2

The 42nd constitutional convention of the United Mine Workers of America will be held October 2-10 in Cincinnati, Ohio. The notification to local unions was signed by John L. Lewis, president; Thomas Kennedy, vice-president; and John Owens, secretary-treasurer.

UMWA expects 3000 delegates to attend the convention.

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● Developed by the maker originally for his own use the Compton Auger is the successful result of much engineering research plus exhaustive field tests and actual on the job experience. Painstaking effort which reflects in the many Compton Augers now in use profitably recovering tons of coal for their satisfied owners.

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Mine Ownership Acquired

National Steel Corp. has become sole owner of the Renton Coal Co., Allegheny County, Pa., by acquiring the 60-percent interest of Pittsburgh Consolidation Coal Co. in Renton.

National Steel, which has taken over management of Renton, and Pitt-Consol are affiliates, with The M. A. Hanna Co., Cleveland, having a substantial stock interest in each of them.

Renton mines metallurgical-grade coal in the upper Freeport seam.

When organized four years ago, Renton purchased the Renton No. 3 mine from Pitt-Consol and took leases from both Pitt-Consol and National Steel on acreage in the vicinity. There are about 5000 acres of coal land in the tract.

Renton production last year was 850,000 tons. Approximately 335 men are employed in the mine.

Modernize Tire Hill Mine

Bird Coal Co., Johnstown, Pa., is spending \$1,500,000 to modernize its No. 2 mine at Tire Hill in Somerset County, including the construction of a cleaning plant.

Pennsylvania Uranium Plant

Vitro Rare Metals Co., a division of Vitro Corp. of America, has announced it will build the first commercial primary uranium processing plant in the east at Canonsburg, Pa. It is expected to be in operation in about eight months.

New Process Developed

The U. S. Bureau of Mines has developed a revolutionary new process which is relatively inexpensive to extract tantalum and columbium from ores, concentrates and smelter slags.

A report outlining the new process has been prepared by Bureau scientists after two years of research. The report, entitled "Separation of Tantalum-Columbium by Solvent Extraction," is numbered R.I.I. 5239 and may be obtained from the Bureau of Mines, Publications Section, 4800 Forbes Street, Pittsburgh, Pa.

The refining method commonly used today, a modification of one first suggested nearly a century ago, can be used economically only with high-grade ores or concentrates. The new method, on the other hand, is more efficient and promises to enable industry to utilize low-grade materials.

The new process which yields both columbium and tantalum oxides of better than 99 percent purity, appears feasible for industrial use. It is suitable for treating low-grade concentrates, and is effective regardless of the columbium-tantalum ratio of the feed material.

Launch the "Salvati"



The "Raymond E. Salvati," latest addition to the river fleet of the Island Creek Fuel and Transportation Co.

A NEW 148-ft towboat, named the *Raymond E. Salvati* in honor of the president of Island Creek Coal Co., to serve the expanding coal trade on the Ohio River was christened in Pittsburgh July 25. The vessel was built by Dravo Corp. for Island Creek Fuel and Transportation Co., Huntington, W. Va., parent firm of the transportation company.

Official christening ceremonies were held at the Allegheny Wharf at Pittsburgh's Point, where the Monongahela and Allegheny Rivers meet to form the Ohio.

Powered by twin diesel engines developing 2560 hp, the vessel is reported to incorporate many developments that increase its barge-pushing ability. Each of the twin four-bladed propellers is eight ft six in.

in diameter. The propellers rotate inside specially designed Dravo Kort Nozzles which increase thrust by controlling the flow of water to and away from the propellers.

Six rudders, one behind and two ahead of each propeller, are operated hydraulically and controlled by steering levers in the pilothouse.

Main deckhouse of the 34-ft wide vessel contains the galley, mess room, machinery space, steering gear compartment and lounge and quarters for the crew. The upper deckhouse has staterooms for officers and a lounge which can be converted into private quarters for guests.

The pilothouse, on the forward end of the upper deckhouse, is equipped with all modern aids for navigation, including radar and telephone.

FOR SALE

1,760' ROPE-AND-BUTTON TYPE HILLSIDE RETARDING CONVEYOR IN TWO SECTIONS; one 1,240', the other 520', capacity 300 tons per hour, completely equipped with reciprocal plate feeder, 3,520' of 1 1/4" wire rope (used less than 6 months), all necessary cable clamps (buttons), sprockets, bearings, shafts, pinions, pulleys, sheaves, etc., to make up complete conveyor. Conveyor is mounted on and supported by a structure of Oregon fir, in first class condition, which can be dismantled in sections for transportation and can be reused. The complete conveyor, including wire rope, operating equipment and supporting structure, may be inspected over its entire length from a walk-way which extends full length of conveyor. Above equipment recently taken out of operation and all in excellent condition. Conveyor located at Lorado, West Virginia, and may be inspected at any time at your convenience. If you are interested in inspection or further information, please communicate with

THE LORADO COAL MINING CO.
33 North High Street
Columbus 15, Ohio

Will Open Mine

Elkhorn Coal Corp. of Kentucky, an affiliate of Pittsburgh Consolidation Coal Co., is opening a new mine near Alexander, W. Va., on leased coal acreage. The company will operate in West Virginia under the name of Peerless Sewell Coal Co.

The new deep mine operation will aim at a production of 1000 tpd. Superintendent is Van B. Stith of Huttonsville, former vice-president and general manager of Anchor Coal Co. at Highcoal, W. Va.

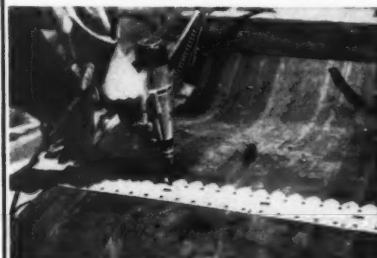
Gypsum Output Sets Record

Gypsum output in the Canadian province of Nova Scotia reached 3,700,000 tons in 1955, a new record according to the province's Department of Mines. Output for 1956 is expected to reach 4,000,000 tons.

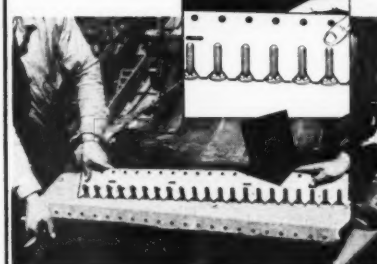
The Department also reported that Mineral Explorations, Ltd., plans to develop a zinc ore body at Meat Cove, Victoria County, this year and that a scheelite and copper occurrence at Fox Island and Canso would be diamond-drilled.

NEW FLEXCO POWER TOOLS CUT APPLICATION TIME IN HALF

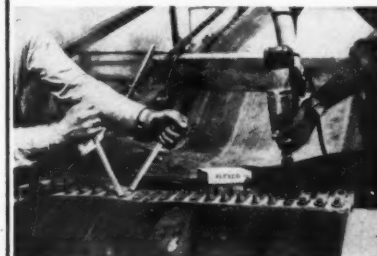
Your two man belt team can now join a belt 30" wide in 15 to 20 minutes . . . using the new FLEXCO Power Tools.



The FLEXCO Power Tool Boring Bit used with electric or air impact tool speeds boring of holes.



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Running down nuts is fast with the new FLEXCO Power Wrench used with electric or air impact tool. Two Bolt Breakers are used together to complete the joint.

If you are interested in speeding up fastener application, order the new Power Tools from your local FLEXCO Distributor. Write for Bulletin F-112-A.

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Western States

Anaconda Honors Employees

More than 200 Anaconda Co. employees were honored at a dinner at Butte, July 17, the first of five which will pay tribute to over 900 employees with 25 or more years of continuous service. Chester H. Steele, vice-president in charge of western operations, presented service pins to the employees. Similar dinners were held July 23, 24, 30 and 31 at Butte.

Such dinners are also planned for the workers of the Butte, Anaconda and Pacific Railroad and the refinery employees at Great Falls. A total of 2444 persons in Anaconda's western operations in Montana, Idaho, Utah, Nevada and California will be honored for their 25 years or more of service. About 7000 employees will be so honored throughout the world.

Colorado Safety Record

Colorado's chief mine inspector Thomas Allen has reported that for the first time in 72 years of recording accidents, there were no fatalities in Colorado mines during the first six months of a calendar year. Allen sent a congratulatory message to mine officials lauding the achievement of an outstanding record.

Spokane Uranium Mill

The Atomic Energy Commission has announced the signing of a contract with Dawn Mining Co., subsidiary of Newmont Mining Corp., for the construction of a uranium mill serving the Spokane, Wash., district. The plant site is near Ford, Wash., and the new mill will process Dawn ores as well as production from independent producers.

Following execution of the contract, Dawn announced the award of a contract for the construction of a uranium processing mill to Western Knapp Engineering Co. of San Francisco. Robert B. Fulton, Dawn manager, said work on the cost plus, fixed fee contract was scheduled to start immediately. The 400-ton plant is slated to be completed in about one year. It will utilize a column, ionic flowsheet, the process having been investigated and tested by National Lead Co. and the U. S. Bureau of Mines

under AEC sponsorship. Details of the processing include a regular mill circuit, utilizing acid leaching, counter-current decantation and thickening followed by uranium recovery in the ion exchange columns.

Dawn has also announced the award of a contract to Isbell Construction Co. of Reno, Nev., for stripping overburden on its properties. The amount of the contract was not disclosed, but company officials said it entailed stripping Hill No. 1 and the 459-acre Boyd leases which the company recently purchased.

Bunker Hill Acquisition

Northwest Lead Co. of Seattle, controlled by Bunker Hill Co. since 1931, has been acquired by the parent firm

and will become its sales and fabrication division. Roger H. Cutting, who has been president of Northwest Lead since 1935, has been named manager of the new division and will make his headquarters in San Francisco.

Northwest Lead, which manufactures sheet lead, lead pipe, and their alloys, as well as solders, babbitts and a variety of allied products, has sales offices and warehouses in Los Angeles, Oakland and Portland, in addition to its plant in Seattle.

Lisbon Adds New Producer

Lisbon Uranium Corp. of Utah has concluded an agreement with Feusner and Sons, Basin, Wyo., for the operation of a 41-claim producing property in the Big Horn Mountains of north central Wyoming. Approximately 175 tons of uranium ore had been shipped from the property to the Riverton buying station prior to the transaction.

Grandview Takes Option

Grandview Mines Inc. has taken an option to purchase the Scandia lead-zinc mine on Deep Creek in northern Stevens County, Wash., according to Karl W. Jasper, Grandview president.

Boyles Brothers of Salt Lake City have moved a diamond drill rig onto the property and drilling has started, he said.

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PENETRATING OIL GIVES YOU THE ADVANTAGES OF:**

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SPECIALISTS IN FINE PENETRATING OIL FOR OVER THIRTY YEARS

Ten U-Mill Bids

Allen E. Jones, manager of the Grand Junction, Colo., operations office of the Atomic Energy Commission, has disclosed that the agency now has ten formal applications for mill construction under consideration.

He said that eight of these applications are for new mills, and the other two are for expansion of existing facilities.

Lease Limestone Claims

Edna Bay Pure Stone Co., a Texas corporation, has announced the completion of negotiations with Aluminum Co. of America for a long-term lease of Alcoa's Edna Bay, Alaska, limestone claims.

A total of 27 claims, patented by Alcoa 10 years ago, are involved in the lease arrangement. They will constitute the principal raw material source of a large lime plant to be installed by Edna Bay Pure Stone Co. in the Vancouver, Wash., area.

The Edna Bay limestone deposits are located north of the International Boundary on the southern tip of Kosciusko Island. The Edna Bay Pure Stone Co. plans to quarry the chemical grade, high calcium stone, and transport it in self-unloading Victory

ships to the Vancouver processing plant. Lime produced from the stone will be used by the cement, paper, sugar beet and carbide industries on the West Coast.

Construction of the new plant, engineered for a daily capacity of 300 tons, will begin early in 1957. It will be located on the Columbia River.

K. B. Diehl, developer of the Edna Bay project, also is president of the Texas Portland Cement Co.; chief engineer and general manager of the Mississippi Valley Portland Cement Co.; and general manager of Verde Valley Industries of Arizona. Verde Valley Industries recently purchased the United Verde Copper Smelter at Clarkdale, Ariz., and is erecting a 5000 barrel per day cement plant on that site.

Increases Sulfuric Acid

Garfield Chemical and Manufacturing Corp., a jointly owned facility of American Smelting and Refining Co. and Kennecott Copper Corp., is expanding production of sulfuric acid to 1100 tpd by constructing its fifth contact process sulfuric acid plant at Garfield, Utah. The new plant is located at the Garfield Smelter of American Smelting and Refining Co. and uses as raw material sulfur dioxide gas produced by the Garfield

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Excellent opportunity for qualified individual to handle sale of mining equipment. Desire man experienced dealing with top management. Age 30-40 years. Travel required. Established company. Replies confidential. Address Box 818 in care of this publication.

Smelter copper converted operation.

Output of the new plant is expected to go entirely to the growing intermountain area industry.

New Lead-Zinc Shipments

Itaco Uranium, Inc., recently shipped 20 tons of lead-zinc concentrates from its mill at Ouray, Colo., to U. S. Smelting Refining & Mining Co., Salt Lake City. Bill Hines, Itaco secretary-treasurer, said the mill will ship from 50 to 60 tons of concentrates weekly from now on. The company has also shipped an experimental 60-ton carload of raw ore from its Bradley lead-zinc mine near Telluride, Colo.

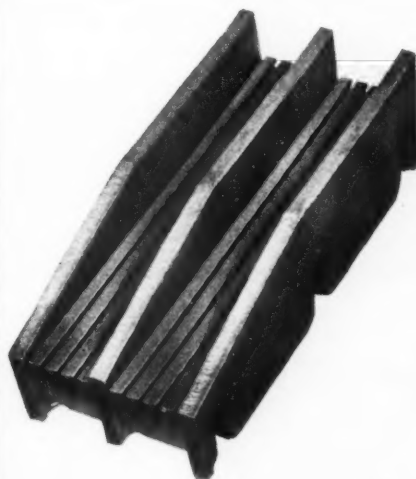
During June, shipment of 640 tons of uranium ore was reported from Utaco's Allen No. 2 mine in Red Canyon, San Juan County, Utah.

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Any mining "specialist" will tell you there's nothing like this Hendrick Wedge-Slot C-12 Screen with mounted skid bars for heavy duty metal mining.

The rugged skid bars protect the wedge-slot profiles from the large ore chunks. The C-12 profile bars

have thick parallel head flanges to maintain uniformity of openings until the entire head is worn down. Designed for tops in heavy duty service and excellent drainage quality, C-12 bars are 12/64 of an inch wide . . . slots run the whole length of the screen. Write for details.



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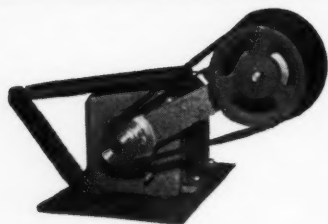
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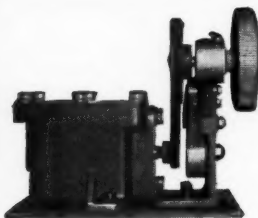
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ENSIGN Centrifugal Switches protect your belt conveyors against fire due to slippage on the pulleys. The switch, when used with a time delay, such as an Agastat, will automatically shut off motor when normal speed of belt conveyor is reduced due to interference.

... Saves replacement of expensive belting ... prevents loss of tonnage due to down time ... eliminates the hazard of fires ... provides greater safety to workers ... can be used for sequence operation of multiple belt system ... operates forward or reverse direction.



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(Dust-tight)



Bulletin 1101
(Explosion-tested)

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Texas-Zinc Uranium Mill

Texas-Zinc Minerals Corp. has signed a contract with the Atomic Energy Commission for the construction and operation of a uranium processing mill near Mexican Hat on the San Juan River in southeastern Utah. Texas-Zinc is jointly owned by the Texas Co. and The New Jersey Zinc Co., and recently acquired The Happy Jack mine in a multi-million dollar purchase.

Under the terms of the contract, the uranium concentrate product of the new mill will be sold to the Commission on a unit price basis. Uranium ores from the White Canyon area of Utah, and the Monument Valley area of Arizona, will supply part of the plant feed. In addition to processing ores owned, leased, or otherwise controlled by the operating company, a certain amount of amenable ores will be purchased from independent producers of the region.

The plant site is about one mile south of Mexican Hat, Utah. Its water supply will come from the San Juan River, and power for the plant will be provided by a high voltage line connecting with the Utah Power & Light Co. at Blanding, Utah.

Construction of the plant is expected to begin immediately, with completion scheduled in about 14 months.

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Three Firms Combine

Mining and oil firms from three states have announced the formation of a new company to mine and mill uranium ores in the Ambrosia Lake area of New Mexico.

Dean A. McGee, president of Kerr-McGee Oil Industries, Inc., Oklahoma City; L. M. Halper, president of Pacific Uranium Mines Co., Los Angeles; and Carl C. Anderson, president of Anderson Development Co., Albuquerque, jointly announced formation of the company, Kermac Nuclear Fuels Corp., to be headed by McGee. Negotiations will be initiated with the Atomic Energy Commission for the construction of a mill in the Ambrosia Lake area.

Oregon Lime Plant

The Chemical Lime Co. will construct a new \$750,000 lime plant north of Baker, Ore. The 50,000-ton per year plant will be located on the Union Pacific Railroad about eight miles from a proven deposit of high grade limestone.

Copper Refinery Closed

Because of a declining demand for fire-refined copper, the Chino Mines Division of Kennecott Copper Corp. has shut down its fire refinery at Hurley, N. M., and is now casting all its output of metal as "blister" copper. The refinery's 65 employees have been assigned to other jobs in the smelter for the time being.

Safety in Block Caving

(Continued from page 94)

be taken. Be sure that the valves on the pneumatic columns are properly guarded. Use some type of safety screens if workmen are present in the drift beyond the head block.

Blasting. Work out a fool-proof system to prevent drilling, charging and blasting operations in one drift from affecting the workmen in another. Modern explosives can propagate considerable distances. Use primacord throughout the entire length of the hole to avoid possible breaks in the chain of detonation. Leave primacord hanging from the hole and use electrical detonators up in the hole. This can be very important in case of a mis-fire. Positive tamping or stemming is a must to keep loose sticks from falling part way down the hole and exploding on or near the back of the drift.

Entrance and Exit. Wherever and whenever possible, provide travelway connections at both ends of scraper transfer drifts for second outlets, proper ventilation and to aid in repair work.

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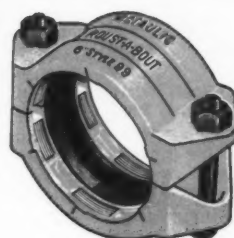
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Elbows, Tees, Reducers, Laterals, a complete line—fit all Victaulic Couplings. Easily installed — top efficiency. Sizes ¾" to 12".



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Vitro-Four Corners Deal

J. Carlton Ward, Jr., president of Vitro Corp. of America, and Eugene H. Sanders, president of Four Corners Uranium Corp., have announced that the two corporations have concluded a long-term agreement covering the field of uranium ore mining and processing. The agreement calls for shipment of uranium ores by Four Corners from its mines near Green River, Utah, to the Salt Lake mill of Vitro Uranium Co. Four Corners will start shipping 3000 tons of ore per month and may increase this monthly delivery to 12,000 tons. The agreement will extend as long as Vitro operates the Utah mill and Four Corners has minable orebodies.

Idaho Clay

The Idaho Bureau of Mines and Geology has released a report on the known clay occurrences in northern Idaho. The deposits in Latah county alone may contain as much as 500,000,000 tons, the report reveals. These deposits are now under investigation by Anaconda Co. as a possible source of alumina, while the J. R. Simplot Co. is studying these clays as a source of raw material for the ceramics industry.

Northern Idaho clays extend from Coeur d'Alene on the north to Grangeville on the south in a belt about 50 miles wide by 130 miles long, the report states. Deposits of possible ceramic quality have been noted in Kootenai, Benewah, Latah, Nez Perce, Lewis, Clearwater and Idaho counties.

A copy of the report may be obtained by mail for one dollar from the Idaho Bureau of Mines and Geology, University of Idaho, Moscow, Idaho.

New Mexico Cement Plant

Permanente Cement Co. plans to build a \$10,000,000 cement plant at Scholle, N. M. The 1,400,000-bbl plant will be located about 55 miles southeast of Albuquerque. Exploratory drilling has indicated a 100-yr reserve of limestone in the area.

California Clay Find

Discovery of vast new deposits of high-value clay in Bedford Canyon, five miles south of Corona, Calif., has been announced by Gladding, McBean & Co.

The company plans to start immediately with the construction of a vitrified clay pipe plant adjacent to the clay deposit. An expenditure of \$3,000,000 will be made at once with an additional \$2,000,000 to be spent later.

The pioneer ceramic products company will utilize the deposit in making vitrified clay pipe, principally for sewer lines and storm drains, at the

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Rare Earths Division. Saint Louis, Michigan

plant to be constructed at Corona. Also to be manufactured at the new plant is multiple-duct vitrified clay conduit for telephone and power cable installation.

Drilling and laboratory tests indicate a 100-year supply of clay for Gladding, McBean. The deposits were found to be from 40 to 150 ft deep.

Initial capacity of the new plant will be rated at 6000 tons per month with constant growth designed to bring capacity to 12,000 tons per month. The plant is expected to be in operation by September 1957.

Increasing Lead-Zinc Output

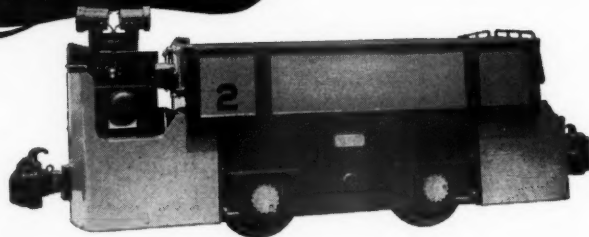
United Park City Mines Co. has announced plans to increase production, through intensive mine development and exploration, from 7000 to about 10,000 tons of ore monthly.

S. K. Droubay, general manager of the Park City District property, revealed that United Park City had expended approximately \$1,000,000 on exploration and development during the past 12 months. A number of promising areas were opened during this period.

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Storage Battery Locomotives

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"Double Equalizers"
make the difference



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All Greensburg locomotives are Custom-Built to meet your requirements in both single and double motor drive with drum, cam or contactor type controllers.

For more earning power per invested dollar specify Greensburg Storage Battery Locomotives.

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Announce Venture Agreement

A joint venture agreement calling for the expenditure of \$150,000 per year in development and exploration of mining claims in northern California has been entered into by Phelps Dodge Corp. and Shasta Copper and Uranium Co., Inc., according to K. L. Stoker, Salt Lake City, president of Shasta.

The properties involved are 250 mining claims in the West Shasta mining district of northern California. The claims encompass properties formerly known as Sugar Loaf, Shasta King and Balakalala.

A joint board has been appointed by the two firms to operate the venture. Phelps Dodge named W. C. Lawson, general manager at Douglas, Ariz.; W. A. Evans, Phoenix, and G. A. Swanson. Appointed by Shasta were K. L. Stoker and W. J. Walker, Colorado Springs.

Stoker said the agreement calls for the expenditure of a minimum of \$150,000 per year for five years, and will continue in effect thereafter "as long as the properties have minable ore."

Finds Ore Body in San Juan

Standard Uranium Corp. has reported development of a new ore body some distance from major producing areas of its uranium mine in Big Indian District, San Juan County, Utah.

W. E. McCormick, Standard president, said, "It is altogether too early to say how many tons we have and what this discovery means to the earnings of the company. It is an addition to our reserves that definitely extends those reserves, however."

Canadian Copper Plant

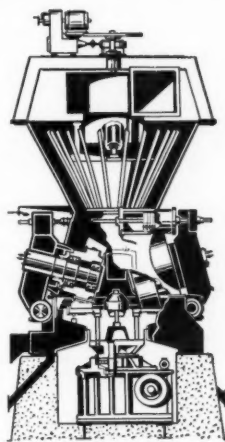
In a letter to shareholders, L. T. Postle, president, disclosed that Granby Consolidated Mining, Smelting and Power Co., Ltd., is planning to build a concentrator to treat 500 tons of copper ore daily from the famed old Phoenix mine near Greenwood, B. C.

The mill is scheduled to get into production in the first half of 1957. The plant will be built as far as possible with surplus equipment from the firm's Copper Mountain, B. C., operation.

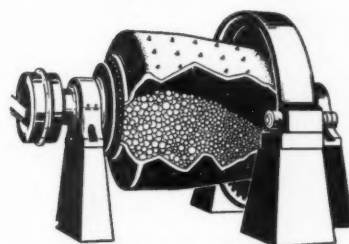
Open-pit mining methods will be used to extract ore remaining at the Phoenix property. Granby sold this property in 1936 but last year negotiated an option to repurchase it from W. A. McArthur, Greenwood's mayor.

A diamond drill search for new ore deposits was started last October. The company also has been testing the old Lone Star copper property south of the international boundary and north of Curlew, Wash.

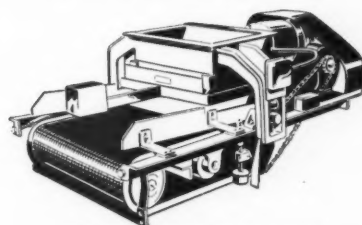
HARDINGE MILLING EQUIPMENT



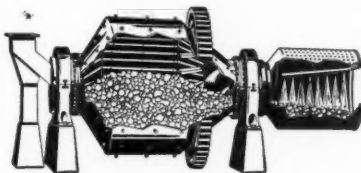
DISC-ROLL MILLS



CONICAL AND TRICONE MILLS



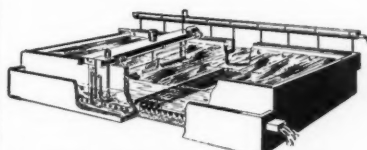
CONSTANT-WEIGHT FEEDERS



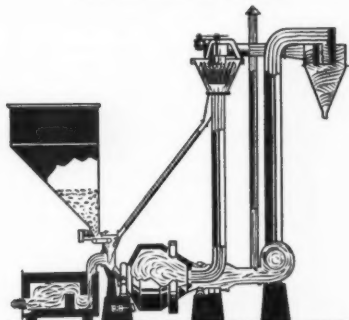
CONICAL SCRUBBERS



RUGGLES-COLES DRYERS



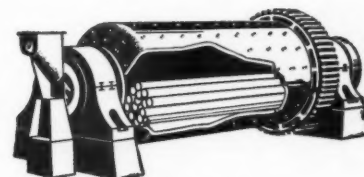
AUTOMATIC BACKWASH SAND FILTERS



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ROD MILLS



HYDRO-CLASSIFIERS

See our exhibit at the Mining Show in Los Angeles, Booth 936, featuring our new Disc-Roll Mill.

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Begins Mexican Sulphur Operations

Texas Gulf Sulphur Co., which has spent over \$8,000,000 on its Mexican project, is now mining sulphur from the Isthmus of Tehuantepec. Texas Gulf operates there through its Mexican subsidiary, Compania Exploradora Del Istmo, S. A.

The mining is being done by two barge-mounted units making up a self-contained sulphur producing plant, which was transported 800 miles from Houston to the Texas Gulf deposits near the Coachapa River.

The mobile Frasch-process plants can be shifted in accordance with producing areas, reducing the cost of pipe and other items.

The deposit is 25 miles from the free port of Mexico on the Gulf of Mexico. The port connects with Salinas Cruz, on the Pacific Coast, by means of a 150-mile rail line, thus facilitating shipments to Pacific ports.

Builds New Acid Unit

Monsanto Chemical Co., St. Louis, Mo., has begun construction of a phosphoric acid unit at the Colorado Fuel & Iron Corporation's plant in Pueblo, Colo.

The phosphoric acid unit, first of its particular kind and size, has been engineered specifically to meet the needs of the CF&I coal chemicals operation.

Electric furnace elemental phosphorous will be shipped from Monsanto's plant at Soda Springs, Idaho, to Pueblo, where it will be burned in the new unit to make phosphoric acid. This acid will then be pumped directly into the CF&I plant system for use in the production of diamonium phosphate, an analysis fertilizer material.

Use of phosphoric acid, instead of sulphuric acid, for recovery of ammonia from coke oven gas was pioneered by CF&I.

Dredge Law Court Test

The first court test of Idaho's 1954 dredge mining control law appears likely following the recent decision by the Idaho land board to cancel the gold-dredging permit of the Clearwater Dredging Co.

Vernon B. Finch, Spokane, owner of the dredge which has operated since 1952 on the Crooked River in Idaho County, has announced he will fight the ruling that his dredging operations have failed to keep the river waters "reasonably clear" as required by the law.

Finch contends that the law is unconstitutional because it does not establish standards on how clear the river must be kept and because it is discriminatory in applying only to dredges handling more than 500 cu yd of material daily. He also denied that his dredging operation is muddying

the river enough to harm trout fishing, as claimed by the Grangeville Wildlife Association. He said that his dredge, which handles from 1700 to 2000 cu yd of gravel per day, will continue in operation under a new permit pending the courts' decision regarding the law's constitutionality.

Kennecott to Produce Zirconium

Kennecott Copper Corp. will begin design and construction shortly of a new test plant in the Cleveland area to produce the metal zirconium, with operation to be under way late next year. The announcement followed completion of licensing arrangements with Horizons Titanium Corp., Princeton, N. J., whereby Kennecott has acquired licenses for the electrolytic production of zirconium and its by-product, the metal hafnium.

The agreement with Horizons Titanium Corp. also provides Kennecott with options for licenses for electrolytic production of other metals, including titanium, thorium, columbium and tantalum.

Colorado Copper Mine

The Tamarack Mine, located in central Colorado, is being reopened after 53 years of litigation. The property was recently acquired by the Natural

Power Corp., and mining of the proven copper deposits will begin soon, according to Loren Keenan, director. Work has already begun on putting the mine property into shape to begin actual mining operations.

The property is located on the foothills of Mt. Harvard, 12 miles northwest of Buena Vista, Colo., at an altitude of 9145 ft. It was discovered in 1887 and was closed in 1903 when the original owner died. Litigation, started at that time, was terminated this year.

— BOOK REVIEW —

MINING AND THE ARTS THROUGH THE AGES. M. N. Barbier, *French Mining Equipment, 35 Wisconsin Circle, Chevy Chase, Md.*

In commemoration of the International Mining Congress held last June, in Paris, Societe de l'Industrie Minerale has edited, in English, for private subscription this book of art. It contains a foreword and prints on loose plates (11 by 15 in.) of the most characteristic works of art, inspired by mining from antiquity to present days, including at least 16 reproductions in color and from 40 to 50 in black and white.

Our Specialization . . . economically protects your investment!

FLOOD CITY MINE PUMP

RENEWAL PARTS AND REPAIRS



- For many years, Flood City has specialized in furnishing standard replacement parts from stock, and in manufacturing replacement parts for all types of centrifugal and plunger type mine pumps. Damage due to wear and acid can be repaired, and many of the features found on Flood City pumps can be incorporated into the pump when it is rebuilt in Flood City shops. Impellers and other parts can be furnished for any make or type, in any desired material.

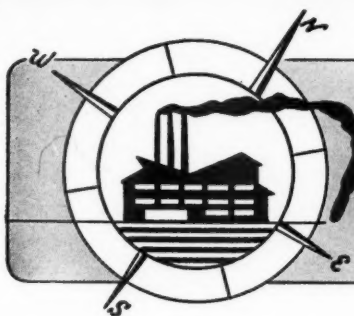
FLOOD CITY ENGINEERING SERVICE

We will be pleased to have an engineer consult with you on any parts or pump rebuilding job on which you may desire a quotation . . . at no obligation to you.

For complete economical pump repair and replacement service . . . contact FLOOD CITY!



FLOOD CITY BRASS & ELECTRIC CO.
JOHNSTOWN, PA.



Manufacturers Forum

Dust Collection

READILY PORTABLE, the M-S-A Drildust Bucket is a device for dust collection in overhead rotary drilling operations where fluted augers are used. Basically, it consists of a rubber hood and a collecting bucket with a support assembly, all of which slide over the drill. Dust created by drilling falls into the bucket, which remains in contact with the roof. No external power for operation is required. The Drildust Bucket is approved by the U. S. Bureau of Mines for rotary drilling vertically and diagonally upward.

For more information, write to Mine Safety Appliances Co., 201 North Braddock Ave., Pittsburgh 8, Pa., for Bulletin No. 1504-3.

Air Hoist

AN AIR - POWERED CHAIN BLOCK capable of lifting loads up to 900 lb at a speed of 36 fpm, has been announced by Atlas Copco Eastern, Inc., Patterson, N. J.

Designated Atlas Copco's Air Motor Hoist MT-504, it is said to be especially



specially suited to usage in machine shops and at contractors' work sites.

The 55-lb hoist operates from a 1/2-in. air line at a pressure of 85 psi. It draws 1.6 cu ft of air per ft of lift.

Hydraulic Hose Selector

A RUBBER COVERED Hydraulic Hose Selector is being offered free to users of Hydraulic Control Hose by the Wiretex Hose Dept., Republic Rubber Division, Lee Rubber & Tire Corp., Youngstown 1, Ohio.

The revised Selector contains S.A.E. and industry specifications on

hydraulic hose. Starting with any known factor, such as ID, OD, minimum burst, working pressure required or bend radius, a designer or maintenance man can use the Selector to determine the proper Wiretex Rubber Covered Hydraulic Control Hose for his needs.

Inquiries about new equipment appearing in Manufacturers Forum are welcomed.

For additional information on any piece of equipment in this section write directly to the manufacturer, or to Mining Congress Journal with name of item and date of issue in which it appeared.

Power Take-Off

A HEAVY - DUTY FRICTION POWER take-off, the SP-321, can reportedly handle up to 6730 lb-ft of torque and transmit up to 602 hp at 1550 rpm. It's available with a standard SAE No. 00 flywheel housing adapter. Other features claimed include a triple driving-plate construction to provide ample friction surfaces to withstand excessive heat, a pilot bearing with double-width bearing race for greater lubrication retention and long life and a spherical roller bearing at the clutch output shaft for greater overload and side-pull capacity.

Request Bulletin 308 from Twin Disc Clutch Co., Racine, Wis.

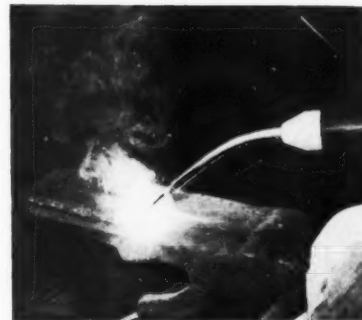
Stereoscope

THIS SINGLE-PRISM stereoscope aids in interpreting stereoscopic aerial photographs. It helps in the identification and recording of locations of cultural, topographic, geologic, military and other features on the ground. Delineation of limits of soil types and vegetal cover as well as quantitative measurement of timber are other uses.

Request more information from Booklime, Inc., 3499 Fleetwood Drive, Salt Lake City 9, Utah.

Tube Rods

DEVELOPED FOR SEMI-AUTOMATIC HARDFACING, these "tube rod" electrodes are 3/32 in. diameter drawn tubular wire and act much like



mild steel solid wire in a welding machine. The tube rod is a perfectly round steel-wire shell with the various alloys enclosed within the shell.

Although the tube rods have been designed specifically for use with the AMSCO MF semi-automatic welder, they may be adopted for use with most semi-automatic machines.

Presently, three electrodes are immediately available: S/A Manganese; SA/53; and S/A 33.

Write for six-page brochure to: American Manganese Steel Division, Chicago Heights, Ill.

Rok-Bits

A LINE OF TAPER-SOCKET type Rok-Bits has been announced by Brunner & Lay, Inc., 9300 King St., Franklin Park, Ill. These Rok-Bits



are available in the following gauge sizes: for 7/8-in. drill steel, 1 1/4-in., 1 3/4 in. and 1 1/2-in.—No. 7. Class A Taper; for 1-in. drill steel, 1 1/4 in. and 1 3/4 in.—No. 8 Class B Taper. Bronze shims are supplied with each bit. It is said there are no threads to strip, no body distortion from lock-on, and bit is easily removed from rod.

Underground Truck

DESIGNED SPECIFICALLY FOR UNDERGROUND HAULING, the Oremaster is manufactured by Western Machinery & Engine Co., 320 S. Grand Ave., St. Louis, Mo. It was de-



veloped to permit the operator of trackless haulage mines to use rubber-tired equipment in low head room and narrow drift areas. If your drifts are 8 by 8 ft, you can reportedly use the Oremaster and have room to spare.

Specifications include; over-all length—18 ft 0 in., over-all width—6 ft 6 in. and over-all height—5 ft 6½ in. The truck's complete weight is 9380 lb and it can carry 12,000 lb of payload. The unit has a GM Diesel Engine and an Allison Torqmatic Transmission with torque converter.

Since the unit has three speeds in either direction, the heading can be worked without turning the truck around. Also, according to Western, having a 54-in. height over the side of the dump body permits loading over the side or from the end.

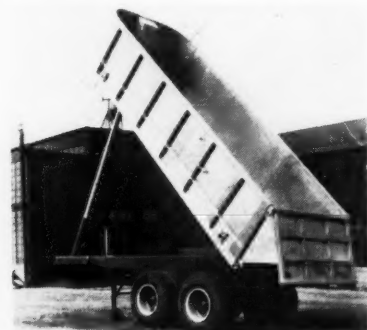
Work Gloves

AVAILABLE IN SAFETY CUFF, gauntlet and knit wrist patterns, this line of industrial gloves, according to the manufacturer, features a new leather, Horsebutt Split Leather, with exceptional wearing qualities. All styles have canvas backs. The company also cites completely satisfactory results in dry cleaning tests of the gloves.

For further information write to Wearhide Glove Co., Rockford, Mich.

All Aluminum Dump Trailer

TWENTY-FT LONG, 8-ft wide and 4-ft high, this aluminum trailer was built of 3/16-in. sections of



Alcoa's 5154-H32 alloy. The aluminum construction is said to eliminate 2000 lb of dead weight. Maintenance problems are said to be minimized because the metal is highly resistant to corrosion.

The trailer is manufactured by the Perfection Steel Body Co., Galion, Ohio, with metal supplied by the Aluminum Company of America.

Electric Trucks

AN ELECTRICALLY-POWERED rock-and-ore truck is now manufactured by Kenworth Motor Truck Co. of Seattle. Known as the 802-E, this truck has a capacity of 16 cu yd struck, or 24 tons.

Current received from overhead wires through a pair of trolleys powers the electric traction motors.



In addition, for use in operating the truck away from trolley zones, a cable reel is mounted under the hood between the front wheels.

Working in close cooperation, engineering departments of Kenworth, General Electric Co. and Riverside Cement Co. developed design details of the electrified truck.

Well Driller

THE LIGHT-WEIGHT Con-Sol Well Driller, formerly produced by Consolidated Industries, Inc., is now being manufactured and distributed by the National Welding & Manufacturing Co. of Newington, Conn., under the name of the National Well Driller.

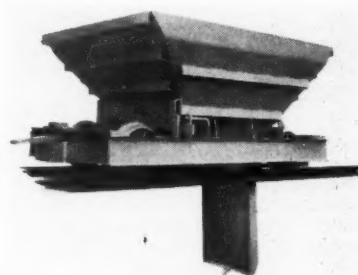
Built of structural steel, the National Well Driller weighs 450 lb and uses four-in. casing in four to five-ft lengths. Eight ft of headroom is required. Power is supplied by ¾-hp electric motor or a 1½-hp gasoline motor. For heavy-duty commercial and industrial applications, the well driller is also produced in a larger model using 6-in. casing.

Further information on the National Well Driller may be obtained by writing to the National Welding & Manufacturing Co., 690 Cedar St., Newington, Conn.

Mine Car

A ONE-DOOR bottom dumping mine car for use on narrow track gauges has been announced by the Sanford-Day Iron Works, Inc., Knoxville, Tenn.

An outside frame construction gives



a low center of gravity for improved trackability and permits building this car with a door opening maximum width between bottom flanges of rails. There are no angles or stiffeners of any kind on the top side of the door where material rests.

Another feature claimed is clean shedding. Flares are on 60°. Cars now in service are being loaded by an overshot loader and from chutes.

Spring trucks may be provided to meet requirements. Also, over-all length may be increased.

Stripping Shovel

THIS EXCAVATOR, with three-cu yd dipper, can be equipped with a 40-ft boom and 29-ft stick or, for added reach and cutting height, a 50-



ft boom with 36-ft stick and 2½-cu yd dipper.

The Koehring Model 1205 Hi-Lift stripping shovel incorporates a single dipper stick with cable crowd and reinforced twin box section boom structure. Other reported features include all-welded turntable and body, improved mechanically operated swing clutches, low level pull and power booster clutches on main drums and a cam arrangement that provides for easy clutch disengagement.

It can be converted for lift crane, dragline or clamshell operation.

Additional information may be obtained by writing to the Koehring Co., Milwaukee 16, Wis.

Rail Tractor

DRIVEN BY STORAGE BATTERY, this rail tractor is built to pull two trail cars with a gross trailer load of five tons. Power is said to



be sufficient to assure starting with a full load from a standstill on a curve. The tractor and its trailers operate on 24-in. gauge track at speeds up to 300 fpm.

Request additional data from Easton Car & Construction Co., Easton, Pa.

Wetdust Nozzle

USED IN COMBINATION with the Bantam "400" duster, the M-S-A Wetdust Nozzle combines the rockdust with water for application in slurry form.

The Wetdust Nozzle can be attached to the standard discharge hose of the Bantam "400" by means of a hose clamp. A water line with a minimum flow of ten gpm and pressure of 50 psi is attached to the nozzle. As the dry dust and air enter the nozzle from the rockdust hose, a fine spray of water is directed into the mixture, thoroughly wetting the dust before it leaves the tip of the nozzle.

For Bulletin No. 1201-3 describing the M-S-A Wetdust Nozzle, write to Mine Safety Appliances Co., 201 North Braddock Ave., Pittsburgh 8, Pa.

Load Cell

OFF-CENTER LOADING STABILITY, provided by a design called the "rolling ball" construction, is said to be a feature in this load cell to be marketed specifically for bin, tank and hopper weighing systems by the A. H. Emery Co., New Canaan, Conn.

A hardened steel ball located beneath the loading platform of the cell between two hardened steel inserts, not only permits the tank or bin to expand laterally, but the ball transmits the force to the cell so no inaccuracies exist in exact weighing. As the ball rolls, the center of loading rolls on the hardened steel inserts.

This self-leveling rolling ball also allows for any tipping of the surface to which it is attached without exerting any undesirable loading on the cell.

The Emery Load Cell acts as a transducer in that force on the cell loading platform is transduced into hydraulic pressure. This pressure is used to actuate an indicator, recorder or controlling device in automatic bin and tank weighing installations.

Conveyor Belt

A NYLON-FILLED FABRIC that is reportedly as strong as steel cable provides the muscle for a new conveyor belt construction announced by The B. F. Goodrich Industrial Products Co., Akron, Ohio. It is the latest addition to the company's line of nylon-filled conveyor belt fabrics.

A belt made with five plies of the new Nyfil 120-RS fabric is as strong as a steel cord belt rated at 1000 psi per ply, according to the company. Nyfil 120-RS is a combination of rayon with nylon filler which permits belt operating tensions up to 200 psi per ply width.

Polyethylene Pipe

A NON-TOXIC, pressure-proved, general-purpose flexible plastic pipe, approved by the National Sanitation Foundation for piping water and other fluids for human or animal consumption, has been announced by American Hard Rubber Co., 93 Worth St., New York 13, N. Y.

Its light weight, flexibility and easy



workability reportedly save considerable time in installing jet and submersible pumps, underground water distribution lines for farm and home, mine drainage lines, and many industrial piping systems handling water or corrosive solutions at normal temperatures.

The pipe is available in 1/2, 3/4 and 1 in. sizes in the 75-lb Pressure Rated Series and in sizes of 1 1/4, 1 1/2 and 2 in. in the Standard Wall Series.

— Announcements —

Goodman Mfg. Co. has named three new assistant district sales managers: John Bragdon at Terre Haute, Ind.; John Cosgrove at Huntington, W. Va.; and Charles Reese at Pittsburgh, Pa.

C. A. Peters has joined The Daniels Co., as preparation engineer. Peters was formerly preparation engineer on the staff of Norman Coal Corp., of Mullens, W. Va.

Nelson L. Davis Co. has announced its main office and engineering department now occupies quarters in the West McHenry Bank Bldg., 517 Main St., West McHenry, Ill. The mid-west sales office of the company remains at 343 South Dearborn St., Chicago 4, Ill.

Personnel changes recently announced by The Jeffrey Manufacturing Co., include: William K. Myers replaces R. W. Sweitzer as district manager of the New York Office; Tom Fear, Jr. replaces Harley Lee as district manager of the St. Louis Office. Lee will continue in an advisory capacity. William T. Davis, formerly of the Houston District Office, goes to Western Territory Sales Office in San Francisco as application engineer. William A. Lewis was appointed sales engineer for the Houston District Office and Ralph Bolton was named sales engineer for the Birmingham District Office. James A. Frazier was assigned to the Industrial Sales Division at the Beckley, West Virginia, District Office.

John Chrystal, manager of Original Equipment Sales in the Home Office, replaces C. O. McFadden as manager of the Columbus District Office. McFadden will continue in an advisory capacity. A. T. Loew succeeds Chrystal as manager of Original Equipment Sales. Succeeding Loew is Dick Ross who will be office manager of the Merchandise Sales Division.

CATALOGS & BULLETINS

METALLURGICAL EQUIPMENT, PLANT DESIGN AND CONSTRUCTION. Western Machinery Co., 760 Folsom St., San Francisco 7, Calif. Entitled "Wemco Equipment—W. K. E. Services," Bulletin G2-B17 describes the company's complete line of equipment and services for mines, mills, and process plants.

CRAWLER TRACTOR. Construction Machinery Division, Allis-Chalmers Manufacturing Co., Milwaukee, Wis. A series of assembly and parts photographs are advantageously used in this catalog, MS-1100, to illustrate the brochure giving design, engineering and operating highlights of the company's 75 hp HD-11 Diesel powered crawler tractor. The cata-

See next page for more Catalogs and Bulletins.

log also contains specifications and a two-page spread devoted to the line of equipment matched to the HD-11 to increase its versatility and job performance capabilities.

HYPALON. *E. I. Du Pont de Nemours & Co., Inc., Elastomers Div., Wilmington 98, Del.* This booklet tells about Hypalon, a synthetic rubber that reportedly offers exceptional resistance to oxidation—which means exceptional resistance to deterioration by heat, ozone, sunlight and weather, and oxidizing chemicals.

HOISTS AND CAGES. *Vulcan Iron Works Co., 1423 Stout St., Denver 2, Colo.* Bulletin No. KA-5001 describes the Vulcan-Denver light-duty gasoline mine shaft hoists and cages with bottom-dump skips.

PUMPS. *Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.* Eight-page, two-color bulletin, Form 7248-A, covers Ingersoll-Rand's redesigned line of DMV-DHV single-stage centrifugal pumps. Construction features are described and installation views, cross sectional views, and an exploded view are shown.

DEHUMIDIFICATION. *Abbeon Supply Co., 179-15A Jamaica Ave., Jamaica 32, N. Y.* Entitled, "Facts about Dehumidification for Industrial Plants, Warehouses, Stockrooms & Laboratories and Laboratories and Home Requirements," Information Bulletin No. 496 goes into details about what humidity is and does. The pamphlet also shows the equipment to dehumidify areas from a home basement to a complete industrial plant.

WIRE ROPE. *American Steel & Wire Division, United States Steel, Rockefeller Bldg., Cleveland 13, Ohio.* Entitled "American Tiger Brand Wire Rope," this 85-pp catalog not only describes and illustrates various sizes and types of wire rope but includes sections on handling, care of and how to order wire rope. Wire rope fittings and lubricants are also noted. Request Form No. 6510.

VIBRATING BAR GRIZZLY. *Nordberg Manufacturing Co., Milwaukee 1, Wis.* Bulletin 261 describes the Nordberg built Symons Vibrating Bar Grizzly, a heavy duty scalping unit with a capacity up to 1000 tph. The machine is especially recommended by the manufacturer for scalping service with materials that are wet, sticky or gummy.

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PROVED ON ONE OF THE
Toughest Testing Grounds
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New

**Run-of-Mine
SCALPING
SCREEN**



Single pieces weighing as much as four tons . . . hundreds of pounds of sticky material adhering to screen body . . . large volume requirements. These are the demanding conditions under which this screen is setting new performance standards.

Here are some of the many features which enable this screen to meet severe duty with *minimum maintenance*:

Extra-Large Bearings (largest ever installed in an A-C screen) withstand punishing loads. Bearing life is extended, replacement less frequent.

Simplified Two-Bearing Mechanism reduces maintenance time and cost.

Cartridge Mechanism can be pulled out after merely removing sheave and four bolts.

Sturdy Channel Construction features 12-inch I-beam deck support.

Soft Support Springs provide smooth, balanced operation. No need to remove adhering material. Practically no vibration transmitted to building.

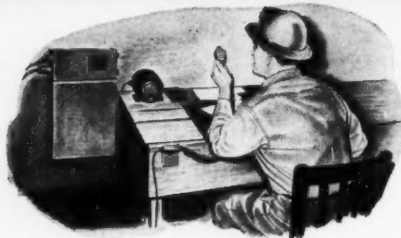
For information on this extra-heavy-duty screen and other Allis-Chalmers screens applicable to your operation, see your A-C representative or write Allis-Chalmers, Milwaukee 1, Wisconsin.

See Allis-Chalmers exhibit at
Mining Show, Shrine Auditorium,
Los Angeles, October 1-4

ALLIS-CHALMERS

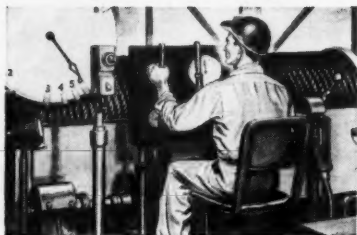


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M.S.A. MINEPHONE

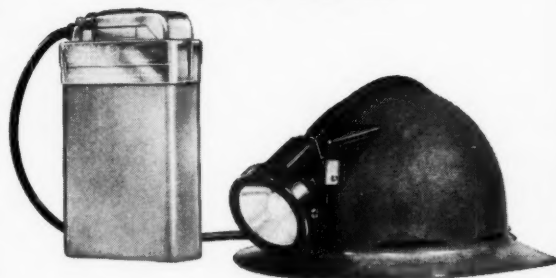
Messages are dispatched instantly to all motormen, who can receive and reply while trips are in motion. System keeps main line haulage-ways free of traffic tie-ups; reduces errors and accidents; prevents excessive stop-and-start strain on equipment.



M.S.A. HOISTPHONE

Continuous, clear voice communication between hoisting engineer and cage, at any level, and while cage is in motion. Ideal for safer load leveling, inspection trips, shaft repairs. Utilizes existing wiring. ALSO—M.S.A. PORTABLE HOISTPHONE—compact unit can be set up anywhere, put into immediate service. Permits temporary communication for inspection work, emergency jobs.

EDISON R-4 ELECTRIC CAP LAMP— M.S.A. TYPE K SKULLGARD



More and better illumination for today's modern mining methods. The R-4 Lamp's brilliant, unfailing illumination lets miners work faster, better, safer. The famous Type K Skullgard, is strong, light, durable. Maximum head protection that is not affected by oil, water, perspiration.

These M. S. A. products can help answer YOUR PRODUCTION-SAFETY NEEDS



M.S.A. SELF-RESCUER

For immediate breathing protection in emergencies. Vital to the miner while traveling through carbon monoxide to fresh air. Available in cache assemblies for storage throughout the mine, or in individual carrying cases. U.S. Bureau of Mines Approved.



M.S.A. CHEMOX

Provides complete breathing protection in any atmosphere. Chemox generates its own oxygen from replaceable chemical canister. Weighs only 13½ lbs. Comfortable in service. U.S. Bureau of Mines Approved.



M.S.A. DEMAND WORK MASK

Breathing protection for planned work in toxic atmospheres. Mask provides self-contained air or oxygen supply. Connecting hoses lets wearer move freely. Manifold arrangement permits use of more than one unit from a single cylinder.



M.S.A. DUSTFOE RESPIRATOR

Maximum protection against dusts. This unit is compact, very light in weight. Its design eliminates "blind-spots," provides wearing comfort that encourages full-time use. U.S. Bureau of Mines Approved.



M.S.A. CHEMKLOS

Made throughout of Dynel, the new fabric that resists acids and caustics, M.S.A. Chemklos answer the need for longer-wearing, smarter-looking work clothes. Special weave for maximum resistance to abrasion. Also, miner's rubber suits, boots, etc.



M.S.A.-LAMB AIR MOVER

Practical, portable ventilating device that uses only compressed air or steam. No motors, turbines, fans. Three sizes—largest size moves as much as 5,160 cu. ft. air per min. Forces air in, or sucks fumes out.

M.S.A. RAIL PUNCH



Makes quick, safe work of punching holes through web sections without need of external power.

M.S.A. PNEOLATOR



Portable, self-contained automatic artificial respiration device. Unit is protected by rugged carrying case.

also—a complete line of portable instruments for detecting CO, H₂S, SO₂, HCN. Instruments for collecting, sampling, counting dusts. First aid kits and materials.



When you have a safety problem, M.S.A. is at your service. Our job is to help you.

MINE SAFETY APPLIANCES COMPANY

201 North Braddock Avenue, Pittsburgh 8, Pa.

At Your Service: 77 Branch Offices in the United States and Mexico

MINE SAFETY APPLIANCES CO. OF CANADA, LTD.

Toronto, Montreal, Calgary, Edmonton, Winnipeg, Vancouver, Sydney, N.S.

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